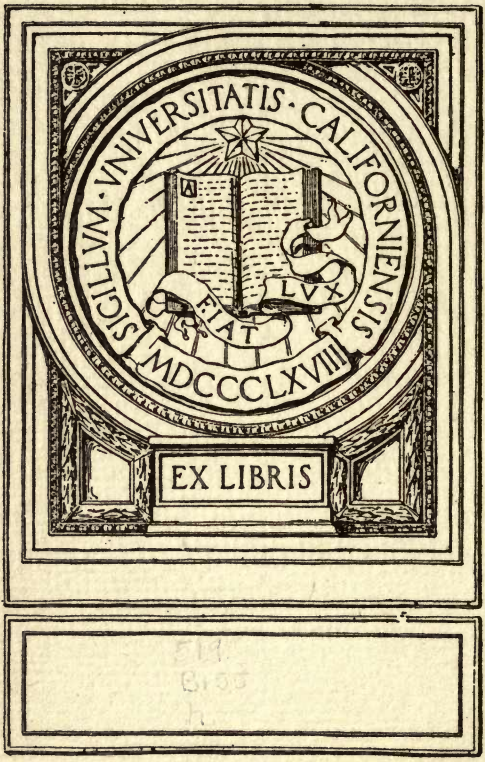
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The Horticulturist's

RULE-BOOK

A Compendium of Useful Information
for

FRUIT-GROWERS, TRUCK-GARDENERS, FLORISTS
AND OTHERS

Completed to the Close of the Year

1889

BY L. H. BAILEY

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The author wishes to be advised of any errors in this work, and he desires any information which will be useful in the preparation of a second edition.

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CHAPTER I.

INSECTICIDES.

Arsenic.—Known to chemists as arsenious acid or white oxide of arsenic. It is considered an unsafe insecticide, as its color allows it to be mistaken for other substances; but in its various compounds it forms our best insecticides. From 1 to 2 grains usually prove fatal to an adult; 30 grains will usually kill a horse, 10 a cow and 1 grain or less is usually fatal to a dog. In case of poisoning, while awaiting the arrival of a physician, give emetics, and after free vomiting, give milk and eggs. Sugar and magnesia in milk is useful.

Arsenites.—Compounds of arsenic, in which arsenious acid unites with some metallic base. The leading arsenites used in destroying insects are Paris green and London purple.

PARIS GREEN.—An aceto-arsenite of copper. When pure, it contains about 58 per cent. of arsenic, but the commercial article usually contains less, often as little as 30 per cent. The following may be considered an average analysis: Arsenic, 47.68 per cent.; copper oxide, 27.47; sulphuric acid, 7.16; moisture, 1.35; insoluble residue, 2.34. It is applied either in a wet or dry condition, but in any case it must be much diluted. For making a dry mixture, plaster, flour, air-slaked lime, road dust, or sifted wood ashes may be used. The strength of the mixture required depends upon the plants and insects to which it is to be applied. The strongest mixture now

Arsenites (Paris green) continued.

recommended is 1 part of poison to 50 of the diluent, but if the mixing is very thoroughly done, 1 part to 100 or even 200 is sufficient.

Paris green is practically insoluble in water. When mixed with water, the mixture must be kept in a constant state of agitation, else the poison will settle and the liquid from the bottom of the cask will be so strong as to do serious damage, while that from the top will be useless. For potatoes, apple trees and most species of shade trees, 1 pound of poison to 200 gallons of water is a good mixture. For the stone fruits, 1 pound to 300 or even 400 gallons of water is a strong enough mixture. Peach trees are very apt to be injured by arsenites, and for them the mixture should be very dilute. In all cases, the liquid should be applied with force in a very fine spray. It appears that at some seasons of the year foliage is more liable to injury than at others.

LONDON PURPLE. An arsenite of lime, obtained as a by-product in the manufacture of aniline dyes. The composition is variable. The amount of arsenic varies from 30 to over 50 per cent. The two following analyses show its composition: 1. Arsenic, 43.65 per cent.; rose aniline, 12.46; lime, 21.82; insoluble residue, 14.57: iron oxide, 1.16; water, 2.27. 2. Arsenic, 55.35 per cent.; lime, 26.23; sulphuric acid, .22; carbonic acid, .27; moisture, 5.29. It is a finer powder than Paris green, and therefore remains longer in suspension in water. It is used in the same manner as Paris green, but is sometimes found to be more caustic on foliage. This injury appears to be due to the presence of soluble arsenic. London purple should not be used on peach trees.

Either Paris green or London purple may be combined with kerosene emulsion to give the material greater adhesiveness to leaves and to increase its wetting power. To 100 gallons of the arsenite mixture, add 1 gallon of kerosene emulsion.

The arsenites may be used in connection with various

Arsenites (London purple) continued.

fungicides, and both insects and plant diseases in this manner may be combated at the same time. An ounce of the arsenites may be added to ten gallons of Bordeaux mixture for potatoes, and other combinations will occur to the operator. The arsenites are also sometimes added to soap and other washes.

Bait.—Paris green or London purple, 1 ounce; chopped grass or leaves, 8 ounces, and syrup enough to allow the mass to be worked into balls. For wire-worm beetles, crickets, katydids, etc.

Bisulphide of carbon.—A thin liquid which volatilizes at a very low temperature, the vapor being very destructive to animal life. It is exceedingly inflammable, and should never be used near a lamp or fire. It is used for many root insects. It is poured into a hole which is immediately closed up, causing the fumes to permeate the soil in all directions. In loose soils it is very destructive to insects. It is also inserted in tight receptacles to kill such insects as pea-weevil and museum pests.

Blue vitriol, or Copperas.—1 ounce of copperas to a pail of water is sometimes effective in destroying root insects.

Coal-tar fumes.—Burn rags coated with coal-tar attached to a pole. Remedy for aphis.

Carbolic acid and soap mixture.—1 pint crude carbolic acid, 1 quart soft soap, 2 gallons hot water. Mix thoroughly. This wash is used for borers, and for plant-lice. Apply with a cloth or soft broom.

Carbolic acid and water.—Add 1 part of acid to from 50 to 100 parts of water. For root insects.

Carbolized plaster.—Stir 1 pint of crude carbolic acid into 50 pounds of land plaster. Or, quick lime may be slaked with the acid. The powder is thrown over the tree when the dew is on, as a remedy for the curculio. It should be applied profusely.

Glue and arsenites wash.—Common glue, 1 lb., soaked a few hours in cold water and then dissolved in ½ gallon

Glue and arsenites wash, continued.
of hot water; add 1 ounce London purple or Paris green, stir well, and add hot water till the mixture measures 2 gallons. For preventing the attacks of borers.

Hot water.—Submerge affected plants or branches in water of a temperature of about 125°. For aphis.

Kerosene.—In pure state, kerosene is used as an insecticide upon many plants, with various results. It does not appear to injure the coleus, rose, grape, peach and pea, but does injure the potato, tomato, and gooseberry.

Kerosene emulsion.—Soft soap, 1 quart, or hard soap—preferably whale-oil soap—one-fourth pound; 2 quarts hot water; 1 pint kerosene. Stir until all are permanently mixed, and then add water until the kerosene forms one-fifteenth of the whole compound. A good way to make the emulsion permanent, is to pump the mixture back into the receptacle several times.

Kerosene and milk emulsion.—Sour milk, 1 gallon; kerosene oil, 2 gallons; warm to a blood heat and mix thoroughly. Dilute 10 times with water. For scale insects and plant lice.

Kerosene and condensed milk emulsion.—Kerosene, 2 gallons, or 64 per cent. of the entire mixture; condensed milk, 4 cans of ¾ pint, or 12½ per cent; water twice the quantity of milk, or 24 per cent.

Kerosene and water emulsion.—Goff atomizes kerosene and water as follows: To the Woodason atomizing bellows a small cup was attached directly in front of the fount for holding the liquid to be atomized. From this cup a very slender copper tube was passed through the side of the fount where it entered the larger tube that conducts the liquid from the fount to the mouth of the bellows. It then curved upward, passing through the center of this tube as far as the mouth of the bellows, where both came to an end at the same point. Kerosene was then placed in the added cup and water in the fount. On working the bellows the liquids are atomized together. The

Kerosene and water emulsion, continued.

proportion of kerosene emitted will depend upon the relative diameters of the two tubes, but it may also be regulated by the relative depths of the liquid in their respective founts. A better way would be to use but a single fount and to divide this into two parts, one for kerosene and the other for water. This would permit the mouth of the bellows to be brought nearer to the plant to be atomized.

Lime spray.—Slake ½ peck or a peck of lime in a barrel of water, straining the lime as it enters the barrel to prevent its clogging the pump. Apply in a spray until the tree appears as if white-washed. For rose-chafer.

London purple.—See Arsenites.

Lye wash.—1 pound concentrated lye, potash, or ¼ pound to 3 gallons water. On an average, 1 bushel of good wood ashes contains about 4 pounds of potash. For scale insects.

Common home-made lye is often diluted with water and applied to apple branches with a brush as a remedy for the bark-louse. It is also recommended as a remedy for the cabbage-worm, being sprinkled on the cabbages with a watering-pot. If concentrated lye is used, a pound should be diluted with a barrel of water.

Lye and sulphur wash.—Concentrated lye, 1 pound, or potash, 1¼ pounds: sulphur, 1½ pounds; water, 3 gallons. For scale insects.

Oil and alkali wash.—1. 1¼ gallons of whale oil, 25 pounds sal-soda; dissolve the sal-soda in 25 gallons of water and heat it to boiling. When boiling pour the whale oil in. Apply the wash when cooled to 130° Fahr.

2. 1 pound of concentrated lye (American) of 80 per cent.; or ⅘ of a pound of Greenbank powdered caustic soda, of 98 per cent.; or 1 pound of solid caustic soda, of 76 per cent.; or 1½ pounds of solid caustic soda of 63 per cent. These varying proportions are given because the caustic sodas in the markets are of different strengths

Oil and alkali wash, continued.

and purity. Whichever one is chosen, add to each amount named ½ pound of commercial potash and dissolve in 6 gallons of water.

Both washes are for scale insects on deciduous trees in winter. (Californian.)

Paraffine oil.—When plants are infested with lice, water them at intervals of three or four days for about three weeks with diluted paraffine in the proportion of a wine-glassful to watering can of water.

Paris green.—See Arsenites.

Plaster and kerosene.—2 quarts of plaster or wood ashes, 1 tablespoonful of kerosene. Mix and rub with the hands until the oil is well incorporated. Bone-flour may be substituted for the plaster.

Promoting growth.—Any course that tends to promote vigor will be helpful in enabling plants to withstand the attacks of plant lice and other insects.

Pyrethrum. A very fine and light brown powder made from the flower heads of species of pyrethrum. It is scarcely injurious to man. Three brands are upon the market:

PERSIAN INSECT POWDER, made from the heads of *Pyrethrum roseum*, a species now cultivated as an ornamental plant. The plant is native to the Caucasus region.

DALMATIAN INSECT POWDER, made from *Pyrethrum cinerariæfolium*.

BUHACH, made in California from cultivated plants of *P. cinerariæfolium*.

When fresh and pure, all these brands appear to be equally valuable, but the home-grown product is usually considered most reliable. Pyrethrum soon loses its value when exposed to the air. It is used in various ways:

1. In solution in water, 1 ounce to 3 gallons.
2. Dry, without dilution.

Pyrethrum (Buhach), continued.

3. Dry, diluted with flour or any light and fine powder. The poison may be used in the proportion of 1 part to from 6 to 30 of the diluent.

4. In fumigation. It may be scattered directly upon coals, or made into small balls by wetting and molding with the hands and then set upon coals. This is a desirable way of dealing with mosquitoes and flies.

5. In alcohol. Dissolve about 4 ounces of powder in 1 gill of alcohol, and add 12 gallons of water.

6. Decoction. Whole flower heads are treated to boiling water and the liquid is covered to prevent evaporation. Boiling the liquid destroys its value.

Good insect powder can be made from *Pyrethrum roseum*, and probably also from *P. cinerariæfolium*, which is grown in the home garden.

Quassia.—Boil 4 ozs. of quassia chips 10 minutes in a gallon of water; strain off the chips and add 4 ozs. of soft water, which should be dissolved in it as it cools. Apply with syringe or brush. 10 or 15 minutes after it has been applied, give the tree a good syringing with clean water. For plant lice.

Resin soap. Ingredients for one barrel of 50 gallons: 10 pounds caustic soda, 98 per cent.; 10 pounds potash; 40 pounds tallow; 40 pounds resin. First.—Dissolve the potash and soda in 10 gallons of water. When dissolved, place the whole amount in the barrel to be used. Second.—Dissolve the tallow and resin together. When dissolved, add the same to the potash and soda in the barrel, and stir well for five minutes or so. Leave standing for about two hours; then fill up with water, stirring well as every bucket of water goes in. Use the following day, 1 pound to the gallon of water. Apply warm. For scale on deciduous trees in summer. (Californian.)

Resin and fish-oil soap.—20 pounds of resin, 1 gallon of fish-oil, 8 pounds of caustic soda, and enough water to

Resin and fish-oil soap, continued.
make 100 gallons. The caustic soda is first dissolved in about 16 gallons of water, after which ½ of the solution is taken out and the resin added to that remaining in the kettle. When all the resin is dissolved, the fish-oil is added to it and the whole thoroughly stirred, after which the balance of the caustic soda solution is added very slowly and boiled for about an hour, or until it will readily mix with water. Use an iron kettle. For scale insects on orange and olive. (Californian.)

Resin and petroleum soap.—Water, 100 gals.; resin, 17½ lbs.; soda (60 per cent.), 7 lbs.; fish-oil, 3 lbs.; petroleum, 2 lbs. The resin, soda and fish-oil, with 20 gals. water, are boiled together for four hours, when the kerosene is added and the whole is thoroughly stirred. While hot, place in a barrel and add the remaining 80 gals. water, and emulsify by thorough stirring. For scale on citrus trees.

Salt and lime wash.—25 pounds of lime (unslaked), 20 pounds of sulphur, 15 pounds of salt, 60 gallons of water. To mix the above, take 10 pounds of lime, 20 pounds of sulphur, and 20 gallons of water. Boil until the sulphur is thoroughly dissolved. Take the remainder—15 pounds of lime and 15 pounds of salt-slack, and add enough of water to make the whole 60 gallons. Strain and spray on the trees when milk-warm or somewhat warmer. This can be applied when the foliage is off the tree, and will have no injurious effects whatever on the fruit buds or the tree itself. For scale on deciduous trees in winter. (Californian.)

Soap and arsenites.—Yellow soap, 4 lbs., which is dissolved in 1 gallon of hot water; add 4 ounces of London purple or Paris green, mix, and dilute with 50 gallons of hot water. For plant lice.

Soap and lime wash.—5 lbs. potash, 5 lbs. lard stirred in 5 gals. of boiling water; 1 peck quicklime slaked in 5 gals. of boiling water, and mixed while hot with the potash and

Soap and lime wash, continued.
lard mixture. Dilute by adding 2 gals. of boiling water for each gallon of the mixture. It will keep indefinitely. For preventing the attacks of borers.

Soap and soda wash.—To soft-soap add a strong solution of common washing-soda, until the mixture becomes a thick paint.

Soap and tobacco.—Dissolve 8 lbs. of the best soft soap in 12 gallons of rain water, and when cold add 1 gallon of strong tobacco liquor. For plant lice.

Soda and aloes.—Dissolve 2 lbs. of washing soda and 1 oz. of bitter Barbadoes aloes, and when cold add 1 gallon of water. Dip the plants into the solution, and lay them on their sides for a short time, and the insect will drop off. Syringe the plants with clean, tepid water, and return to the house. For plant lice.

Soda and resin wash.—Salsoda, 3 lbs., added to 1 pint of hot water; add slowly 4 lbs. of resin, and gradually add 2 pints of hot water. Dilute to 5 gallons. For scale insects; also recommended for curculio.

Soda wash.—Dissolve ½ pound of common washing-soda in a pail of water.

Sulphide of soda wash (Hilgard's).—Dissolve 30 pounds of whale-oil soap in 60 gallons of water, by heating the two together thoroughly. Then boil 3 pounds of American concentrated lye with 6 pounds of sulphur and 2 gallons of water. When thoroughly dissolved it is a dark brown liquid, chemically called sulphide of soda. Mix the two—the soap and the sulphide—well, and allow them to boil half an hour. Then add about 90 gallons of water to the mixture, and it is ready for use. Apply it warm, by means of a spray pump. Used warm, its effect is better and less material is required than when cold. For scale on deciduous trees in summer. (Californian.)

Sulphur.—Fumes of sulphur is destructive to insects, but it should be carefully used or plants will be injured. For greenhouse use, few insecticides are superior. The sulphur should be evaporated over an oil stove, until the room is filled with the vapor. The sulphur should never be burned, as burning sulphur kills plants.

Sulphur and snuff.—1 lb. of flowers of sulphur, 1 lb. of scotch snuff, 1 lb. of quicklime, ½ lb. of lamp-black, 1 lb. of soft soap, with sufficient water to make them into the consistency of paint. Wash every branch, from the ground upwards, with a common paint brush before the bloom-buds begin to swell. For plant lice.

Tobacco.—Used in the following ways :

1. Tobacco water, used with whale oil soap.
2. Dust.
3. Fumes. Burn dampened tobacco stems.
4. Nicotyl. Steep tobacco stems in water and evaporate the water.
5. Tea, or common decoction. Boil the stems or dust thoroughly, and strain. Then add cold water until the decoction contains 2 gallons of liquid to 1 pound of tobacco.

Whale oil soap.—1 pound whale oil soap to 5 gallons of water. For mealy bugs and similar insects. It will injure some tender plants.

White hellebore.—A light brown powder made from the roots of the white hellebore plant (*Veratrum album*), one of the lily family. It is applied both dry and in water. In the dry state, it is usually applied without dilution, although the addition of a little flour will render it more adhesive. In water, 1 ounce of the poison is mixed with 3 gallons. Hellebore soon loses its strength, and a fresh article should always be demanded. It is much less poisonous than the arsenites

CHAPTER II.

Injurious Insects, with Remedies and Preventives.

Angle-Worm or **Earth-Worm.** The common angle-worm often destroys greenhouse plants by its burrowing. It is sometimes annoying in gardens also.

Remedy.—Lime water applied to the soil.

Aphides or **Plant-Lice,** and **Bark-Lice.** Minute insects of various kinds, feeding upon the tender parts of many plants.

Remedies.—Kerosene emulsion. Kerosene and water emulsion. Hot water (about 125°). Coal tar fumes.

Apple. Apple Curculio (*Anthonomus quadrigibbus*, Say).—A soft white grub, about half an inch long, living in the fruit,

Remedy.—Arsenites, as for codlin moth.

Apple Flea-Beetle (*Graptodera foliacea*, Lec).—Beetle, one-fifth inch or less long, feeding upon leaves.

Remedy.—Arsenites.

Apple Maggot (*Trypeta pomonella*, Walsh).—Maggot; infests fall apples mostly, occasionally attacks winter fruit. It tunnels apples through and through, causing the fruit to fall to the earth. Prefers summer and fall apples.

Remedies—Immediately destroy all infested fruit, pomace, and apple waste from the house.

Bark Louse (*Mytilaspis pomorum*, Bouché).—Minute insects feeding upon the tender shoots. Later in the season the insect secretes a scale under which it lives. The old scales become conspicuous on the twigs.

Apple (Bark Louse), continued.

Preventive.—Plant unaffected trees.

Remedies.—Spray with kerosene emulsion, soda wash, or soap and soda wash, when the shoots begin to start. Wash the limbs with soap suds or lye water. Scrape off the lice.

BUD MOTH (*Tmetocera ocellana*, Fabr.).—A minute insect, destroying the flower bud of apples, pears, plums, etc.

Remedy.—Arsenites applied when the buds begin to swell, and again ten days later.

CANKER-WORM (*Anisopteryx vernata*, Peck).—Larva, a "measuring worm" an inch long, dark and variously striped, feeding upon the leaves.

Preventive.—Bands smeared with tar or printer's ink, or similar devices, placed about the trunk of the tree to prevent the wingless females from climbing.

Remedies.—Arsenites. Jar the worms into straw, and burn the straw.

CODLIN MOTH (*Carpocapsa pomonella*, Linn).—Larva, three-fourths inch long, pinkish, feeding in fruit; two broods.

Remedies.—Arsenites applied just after the blossoms fall and again ten days or two weeks later. Swine in the orchard. Cloth band about the trunk of the tree, which is examined at intervals of seven to nine days for larvæ and chrysalids.

FALL WEB-WORM (*Hyphantria textor*, Harris).—Hairy larvæ, about an inch long, varying from gray to pale yellow or bluish black, feeding upon the leaves of many trees, feeding in tents or webs.

Remedy.—Destroy by burning the webs, or removing them and crushing the larvæ.

FLAT-HEADED BORER (*Chrysobothris femorata*, Fabr.).—Larva about an inch long, flesh colored, the third segment ("head") greatly enlarged; boring under the bark and sometimes into the wood.

Preventive.—Soap and carbolic acid washes applied early in June and July. Keep trees vigorous.

Remedies.—Dig out the borers. Encourage wood-peckers.

Apple, continued.

PEAR-TWIG BEETLE. See under Pear.

PLUM CURCULIO (*Conotrachelus nenuphar*, Herbst).—Beetle; punctures the fruit and causes it to become distorted.

Remedies.—Arsenite . Plant plum trees at intervals throughout the orchard to attract the curculio, and fight the insects on the plums. See under Plum.

ROOT-LOUSE (*Schizoneura lanigera*, Hausm).—A minute insect which causes swelling upon the roots of the tree, impairing its vitality, or killing it. In another form the insect attacks the young branches. It is then conspicuous from its cottony covering. The treatment for aphis is useful here.

Remedy.—Hot water. Scalding hot water may be poured on the bare roots of trees standing in the soil, or nursery stock may be dipped in water having a temperature of 120 to 150°. Mulching about trees is said to bring the lice nearer the surface.

ROSE BEETLE.—See under Rose. There is practically no remedy for the rose beetle on large orchard trees. Ravages can be prevented, to a large extent, by the lime spray.

ROUND-HEADED BORERS (*Saperda candida* and *S. cretata*, Fabr.).—Larva, an inch long when mature; bores into the tree. It remains in the larval state three years.

Preventive.—Soap and carbolic acid washes applied early in June and in July.

Remedies.—Dig out borers in the fall. Insert a wire into the holes.

TENT CATERPILLARS (*Clisiocampa Americana* and *C. sylvatica*, Harris).—Larva, nearly two inches long, spotted and striped with yellow, white and black; feeding upon the leaves.

Remedy.—Arsenites, as for codlin moth. Burn out nests with torch.

TUSSOCK MOTH (*Orgyia leucostigma*, Sm. and Abb.).—A handsome caterpillar, an inch long, bright yellow with red markings, very hairy. Eats the leaves.

Remedy.—Arsenites.

Apple, continued.

TWIG-BORER (*Amphicerus Bostrichus bicaudatus*, Say).—Beetle, three-eighths inch long, cylindrical and dark brown, boring into twigs of apple, pear and other trees. The beetle enters just above a bud.

Remedy.—Burn the twigs. Catch insects in mating season.

TWIG-PRUNERS (*Elophidion parallelum*, Newm, and *E. villosum*, Fabr.). Yellowish white larvæ, about a half inch long, boring into young twigs, causing them to die and break off.

Remedy.—Burn the twigs.

Apricot. PEAR-TWIG BEETLE. See under Pear.

PLUM CURCULIO. See under Plum.

Asparagus. ASPARAGUS BEETLE (*Crioceris asparagi*, Linn.).—Beetle, less than one-fourth inch in length, yellow, red and shining black, with conspicuous ornamentation, feeding upon the tender shoots. Larva feeds upon the leaves and tender bark.

Remedies.—Freshly slaked lime dusted on before the dew has disappeared in the morning. Poultry.

Aster. ASTER-WORM. A small larva boring in the stem of garden asters about the time they begin to flower, causing the heads to droop.

No remedy is known, but all infested stalks should be burned.

Bean. BEAN-WEEVIL or BEAN-BUG (*Bruchus obsoletus*, Say).—Closely resembles the pea-weevil, which see for description and remedies.

Bag-Worm or Basket-Worm (*Thyridopteryx ephemeræformis*, Haw).—Larva working in singular dependent bags, and feeding upon many kinds of trees, both evergreen and deciduous. In winter the bags, empty or containing eggs, are conspicuous, hanging from the branches.

Remedies.—Hand-picking. Arsenites.

Bark-Lice. See under Aphides.

Blackberry. CANE-BORER. See under Raspberry.

ROOT GALL-FLY. See under Raspberry.

SNOWY CRICKET. See under Raspberry.

Blister-Beetle (*Lytta*, two or three species). Soft-shelled, long-necked and slim black or gray spry beetles, feeding upon the leaves of many trees and garden plants

Remedies.—Arsenites. Jarring.

Cabbage. CABBAGE-WORM, or CABBAGE BUTTERFLY (*Pieris rapæ*, Linn.).—Larva an inch long, green with yellow and black markings, feeding upon the heads; two broods.

Remedies.—Pyrethrum. Hot water (temperature from 140° to 160°), applied forcibly in a fine spray. Lye wash.

GREEN LETTUCE-WORM. See under Lettuce.

HARLEQUIN CABBAGE-BUG (*Strachia histrionica*, Hahn).—Bug about a half inch long, gaudily colored with orange dots and stripes over a blue-black ground, feeding upon cabbage; two to six broods.

Remedies.—Hand-picking. Place blocks about the patch and the bugs will collect under them. In the fall make small piles of rubbish in the patch and burn them at the approach of winter.

MAGGOT (*Anthomyia brassicæ*, Bouché).—A minute white maggot, the larva of a small fly, eating into the crown and roots of young cabbage and cauliflower and turnip plants.

Remedies.—There are no remedies specific for the pest; the best one can do is to remove the plantation to a new plot, as far away as possible, each year. When the plants are in a hot-bed, maggots can be destroyed by inserting bisulphide of carbon into the soil. Puddle the plants when transplanting in a puddle to which sulphur has been added, and sprinkle sulphur about the plants after they are set. Liquid manure applied to the plants is said to drive away the insects. All infested plants should be burned.

The "club-root" of cabbage is not due to the maggot, but to a fungus (which see).

Carrot. PARSLEY-WORM. See under Parsley.

Cauliflower. CAULIFLOWER or CABBAGE-WORM. See under Cabbage.

MAGGOT. See under Cabbage.

Celery. GREEN LETTUCE-WORM. See under Lettuce.

PARSLEY-WORM. See under Parsley.

Cherry. CANKER-WORM. See under Apple.

PLUM CURCULIO. See under Plum.

ROSE BEETLE. See under Rose and Apple.

SLUG (*Selandria cerasi*, Peck).—Larva, one-half inch long, blackish and slimy, feeding upon the leaves; two broods.

Remedies.—Arsenites, for the second brood (which usually appears after the fruit is off), and for the first brood if the trees are not bearing. Hellebore in water. Pyrethrum. Air-slaked lime. Catch mature insects by jarring trees late in the evening or early in the morning.

Chrysanthemum. GREEN LETTUCE-WORM. See under Lettuce.

CHRYSANTHEMUM LEAF-MINER (*Oscinis* sp.)—Works upon the leaves of the chrysanthemum.

Remedy.—Hand-picking.

Corn. BUD-WORM. See Tomato Fruit-worm.

CORNSTALK BORER (*Helotropha atra*, Get.).—Larva, gray, and striped, boring into the stalk.

Remedies.—See Cut-Worm.

GRAIN APHODIUS (*Aphodius granarius*, Linn.)—Beetle, one-eighth inch long, shining black, feeding on kernels in the ground before they sprout.

Remedy.—Soak kernels in water, then stir them in a mixture of Paris green to twenty parts of flour.

Cranberry. CRANBERRY APHIS or LOUSE.

Remedy.—Flooding. See also under Aphides.

FIRE-WORM, or CRANBERRY-WORM (*Phopobota vacciniana*, Packard).—Small larva, green, feeding upon the shoots and

Cranberry (**Fire-Worm** or **Cranberry-Worm**), continued. young leaves, drawing them together by silken threads; two broods.

Remedies.—Flooding for two or three days. Arsenites. Attract the moths to fires at night.

CRANBERRY SAW-FLY (*Pristiphora identidem*, Norton).—Larva, less than one-half inch long, greenish, feeding upon the leaves; two broods.

Remedy.—Flooding. Probably hellebore and arsenites.

WEEVIL (*Anthonomous suturalis*, Sec.).—Beetle, less than one-fourth inch long, cutting off the flower buds.

Remedy.—Flooding.

Cucumber. CUCUMBER or PICKLE-WORM (*Edioptis nitidalis*, Cram.).—Larva, about an inch long, yellowish-white, tinged with green, boring into cucumbers; two broods.

Remedies.—Hand-picking at the first appearance of the caterpillars. Destroy infested fruits.

MELON-WORM.—See under Melon.

SPOTTED CUCUMBER BEETLE (*Diabrotica 12-punctata*, Oliv.).—Beetle, yellowish and black-spotted, about one-fourth inch long, feeding upon the leaves and fruit. Sometimes attacks fruit-trees, and the larva may injure roots of corn.

Remedy.—Same as for Striped Cucumber Beetle.

STRIPED CUCUMBER BEETLE (*Diabrotica vittata*, Fabr.).—Beetle, one-fourth inch long, yellow with black stripes, feeding on leaves. Larva, one-eighth inch long and size of a pin, feeding on roots: two broods.

Preventive.—Cheap boxes covered with thin muslin placed over young plants.

Remedies.—Arsenites. Land plaster. Air-slaked lime. Plaster and kerosene. Apply remedies when dew is on, and see that it strikes the under side of the leaves.

Currant. BORER (*Ægeria tipuliformis*, Linn.).—A whitish larva, boring in the canes of currants, and sometimes of gooseberries. The larva remains in the cane over winter.

Remedy.—In fall and early spring cut and burn all affected

Currant (Borer), continued.

canes. These canes are distinguished before cutting by lack of vigor, and by limberness.

CURRANT-WORM, or CURRANT and GOOSEBERRY SAW-FLY (*Nematus ventricosus*, Klug).—Larva, about three-fourths inch long, yellow.green, feeding upon the leaves of red and white varieties; two to four broods.

Remedies.—White hellebore, applied early. Arsenites after the fruit is picked.

CURRANT MEASURING or SPAN-WORM (*Enfitchia* (Abraxis) *ribearia*, Fitch.).—Larva somewhat over an inch long, with stripes and dotted with yellow or black, feeding upon the leaves.

Remedies.—Hellebore, applied stronger than for currant worm. Arsenites, if the bushes are not bearing. Hand picking.

FOUR-STRIPED PLANT-BUG (*Pœcilocapsus lineatus*, Fabr.).—A bright yellow black-striped bug about one-third of an inch long, puncturing the young leaves and shoots of many plants.

Remedy.—Jarring early in the morning.

GREEN LEAF-HOPPER (*Empoa albopicta*, Forbes).—Small insect working upon the under surface of the currant and gooseberry leaves. Also upon the apple.

Remedy.—Pyrethrum.

GREEN LEAF-HOPPER.—(*Typlocyba albopicta*, Forbes).—A pale green insect about one-tenth inch long, feeding upon leaves of currants and gooseberries, also upon the apple, causing white spots to appear upon the upper surfaces.

Remedies.—Pyrethrum, applied before the insects are fully grown. Tobacco dust.

Cut-Worm. Various species of *Agrotis* and related genera. Soft, brown or gray worms, of various kinds, feeding upon the roots, crown, or even the tops of plants.

Preventives and Remedies.—Encircling the stem of the plant with heavy paper or tin. Arsenites sprinkled upon

Cut-Worm, continued.

small bunches of fresh grass or clover, which are scattered at short intervals about the garden towards evening. Arsenites mixed with shorts, and placed about the plants Make two or three deep holes by the side of the plant with a pointed stick; the worms will fall in and cannot escape. Dig them out. Plow infested land in fall to give birds a chance to find the worms.

Cut-Worm, Climbing. Several species of *Agrotis*. The worms climb small trees of various kinds at night and eat out the buds.

Preventive.—Place strips of tin or bands of tar about the trunk. Dig a small circular hole, with perpedicular sides, about the base of the tree.

Remedies.—Arsenites. Hellebore.

Dahlia. FOUR-STRIPED PLANT-BUG. See under Currant.

GREEN LETTUCE-WORM.—See under Lettuce.

Deutzia. FOUR-STRIPED PLANT-BUG. See under Currant.

Egg Plant. POTATO BEETLE. See under Potato.

Elm. ELM-LEAF BEETLE (*Galleruca xantho-melæna*, Schr.).—A small bettle, imported from Europe, which causes great devastation in some of the eastern states, by eating the green matter from elm leaves, causing the trees to appear as if scorched.

Remedy.—Arsenites with kerosene emulsion

CANKER-WORM. See under Apple.

WILLOW-WORM.—See under Willow.

Endive. GREEN LETTUCE-WORM. See under Lettuce.

Flea-Beetle (*Phyllotreta vittata*, Fabr.; *Haltica striolata*, Harris).—A minute black spotted beetle, feeding upon many plants, as turnips, cabbage, radish, mustard, potato, strawberry, and stocks. It jumps upon being disturbed. Closely related species attack various plants. Very destructive to plants which are just appearing above the surface.

Flea-Beetle, continued.

Remedies.—There are no reliable preventives or remedies. Arsenites applied dry while the dew is on are best. Land plaster, lime, ashes, and tobacco dust, applied in the same manner, are more or less effective. Tobacco decoction used very liberally. Wood-ashes applied liberally. Sometimes these injure the plants. Kerosene emulsion thrown with great force agrinst the plants. Calomel, mixed with flour or ashes. The same remedies apply to other flea-beetles.

Gooseberry. CURRANT-BORER. See under Currant.

CURRANT MEASURING or SPAN-WORM.—See under Currant.

FOUR-STRIPED PLANT-BUG.—See under Currant.

GOOSEBERRY or CURRANT-WORM.—See under Currant.

GOOSEBERRY FRUIT-WORM (*Dakruma convolutella*, Hubn.).—Larva, about three-fourths inch long, greenish or yellowish, feeding in the berry, causing it to ripen prematurely

Remedies.—Destroy affected berries. Clean cultivation Poultry.

GREEN LEAF-HOPPER.—See under Currant.

Grape. APPLE-TREE BORER. See under Apple.

GRAPE-BERRY WORM (*Eudemis botrana*, Schiff.).—Larva, about one-fourth inch long, feeding in the berry, often securing three or four together in a web; two broods.

Remedy.—Burn the affected berries before the larva escapes.

GRAPE CURCULIO.—Larva, small, black with a grayish tint. Infests the grape in June and July, causing a little black hole in the skin and a discoloration of the berry immediately around it.

Remedies.—Jarring and removing berries. The beetle may be jarred down on sheets, as with the plum curculio, Bagging the clusters.

GRAPE-SEED WORM (*Isosoma vitis*, Saunders).—A minute grub, living in the seed of the grape and causing it to become distorted. The injured grapes shrivel.

Remedy.—Burn the affected fruit.

Grape, continued.

GRAPE-SLUG or SAW-FLY (*Selandria vitis*, Harris).—Larva, about one-half inch long, yellowish-green with black points, feeding upon the leaves; two broods.

Remedies.—Arsenites. Hellebore.

GRAPE-VINE FIDIA (*Fidia viticida*).—Beetle, resembles the Rose-bug, somewhat shorter and broader. It appears during June and July, riddling the leaves.

Remedies.—Jarring the trees; the least jar is sufficient. Poultry.

GRAPE-VINE FLEA-BEETLE (*Graptodera chalybea* Illig.).—Beetle, about one-fourth inch long, feeding upon the buds and tender shoots in early spring.

Remedies.—Arsenites. The beetle can be caught by jarring on cold mornings.

GRAPE-VINE ROOT-BORER (*Ægeria polistiformis*, Harris).—Larva, one and one-half inch or less long, working in the roots.

Preventive.—Mounding as for the peach-tree borer.

Remedy.—Dig out the borers. Apply scalding water to the roots.

GRAPE-VINE SPHINX (*Darapsa myron*, Cramer).—A large larva, two inches long when mature, green with yellow spots and stripes, bearing a horn at the posterior extremity, feeding upon the leaves, and nipping off the young clusters of grapes; two broods.

Remedy.—Hand picking.

There are other large Sphinx caterpillars which feed upon the foliage of the vine and which are readily kept in check by hand picking.

PHYLLOXERA (*Phylloxera vestatrix*, Planchon).—A minute insect preying upon the roots, and in one form causing galls upon the leaves.

Preventive.—As a rule, this insect is not destructive to American species of vines. Grafting upon resistant stocks is the most reliable method of dealing with the insect yet known. This precaution is undertaken to a large extent

Grape (Phylloxera), continued.

in European countries, as the European vine is particularly subject to attack.

Remedies.—There is no reliable remedy known. Burn affected leaves. Bisulphide of carbon poured in holes in the ground, which are quickly filled, is sometimes effective. Carbolic acid and water used in the same way is also recommended.

ROSE BEETLE.—See under Rose.

SNOWY CRICKET.—See under Raspberry.

THRIP OR LEAF-HOPPER (*Erythroneura vitis*, Harris).—In various stages, one-tenth inch or less long; feeding on leaves, causing them to appear scorched.

Remedies.—Sticky fly paper secured to a stick and carried over the vines, while another person scares up the insects. Attract to lights at night. Kerosene emulsion. In houses, tobacco smoke, pyrethrum poured upon coals held under the vines, syringing with tobacco water or soapsuds. Fumigation in the field should be done before the insects develop wings—late in July or in early August (in the north). Rake ground clean about vines late in fall in order to expose insects to the weather. It has been found in California that thrips can be greatly lessened by feeding off the leaves with sheep, soon after the grapes are picked.

Lawns. ANTS (*Formica sp.*).—Insects burrow in the ground, forming "ant-hills."

Remedy.—A tablespoonful of bisulphide of carbon, poured into holes six inches deep and a foot apart, the holes being immediately filled up.

Leaf Crumpler (*Phycis indigenella*).—Larva, brown, wrinkled, found on the inside of leaves, which it brings together in masses and attaches them to each other and to the twigs by means of silken threads. The next season young worms appear from the mass and feed on the new crop of leaves.

Remedy.—Gather the masses and burn them.

Lettuce. GREEN LETTUCE-WORM (*Plusia brassicæ*, Riley) —Larva somewhat over an inch long, pale green, with stripes of a lighter color, feeding upon the leaves of many plants, as cabbage, celery and endive.

Remedy.—Pyrethrum. Kerosene emulsion. Hot water.

Lice. See Aphides.

May-beetle or **May-bug** (*Lachnosterna fusca*, Frohl.).—A large and familiar brown beetle, feeding upon the leaves of many kinds of trees. The common white grub is the larval state. It often does great damage to sod and to strawberries.

Remedy.—For beetle, use arsenites, or jar them early in the morning. For grubs, plow up the lawn so as to expose them to field birds and poultry, or turn in hogs.

Mealy-bug (*Dactylopius adonidum*, Linn.).—A white scale-like insect attacking greenhouse plants.

Remedies.—Whale oil soap. Carbolic acid and soap. Removing insects with brush on tender plants. Whiskey, applied with a brush. Fish brine.

Melon. MELON-WORM (*Eudioptis hyalinata*, Linn.).—Larva, some over an inch long, yellowish-green and slightly hairy, feeding on melon leaves, and eating holes into melons, cucumbers and squashes; two or more broods.

Remedy.—Hellebore.

SPOTTED CUCUMBER BEETLE.—See under Cucumber.

STRIPED CUCUMBER BEETLE.—See under Cucumber.

SQUASH-VINE ROOT-BORER.—See under Squash.

Mushroom. MUSHROOM-FLY. The larva bores through the stems of the mushrooms before they are full grown.

Preventive.—Keep the beds cool so that the fly cannot develop. When the fly is present, growing mushrooms in warm weather is usually abandoned.

Onion. MAGGOT (*Anthomyia ceparum*, Meigen).—Nearly indistinguishable from the Cabbage Maggot, which see.

Orange. KATYDID (*Microcentrum retinervis*, Burm.).—A large green grasshopper-like insect, feeding upon the foliage. It is largely kept in check in some localities by a parasitic chalcid fly.

Remedy—Collect the eggs, which are conspicuous on the borders of the leaves.

LEAF-NOTCHER (*Artipus Floridanus*, Horn).—Beetle, one-fourth inch long, greenish-blue or copper-colored, eating the edges of the leaves.

Remedy.—Jarring.

SCALE.—Many species, preying upon the leaves and shoots.

Remedies.—Kerosene emulsion applied with a brush or in spray, just before the trees bloom, and at intervals of two or three weeks as occasion may require. Lye wash. Lye and sulphur wash. Pyrethrum decoction. Resin and fish oil soap. When young the scale is more easily destroyed.

Parsley. PARSLEY-WORM (*Papilio Asterias*, Cramer).—Larva, inch and a half long, light yellow or greenish yellow with lines and spots; feeding upon leaves of parsley, celery, carrot, etc. When the worm is disturbed, it ejects two yellow horns with an offensive odor, from the anterior end.

Remedies.—Hand picking. Poultry are said to eat them sometimes.

Parsnip. PARSLEY-WORM. See under Parsley.

PARSNIP WEB-WORM (*Depressaria heracliana*, De Geer).—Larva, about a half inch long, feeding in the flower cluster and causing it to become contorted.

Remedies.—Arsenites, applied as soon as the young worms appear, and before the cluster becomes distorted. The worms are easily disturbed, and hand-picking is often advisable. Burn the distorted umbels.

Pea. PEA-WEEVIL or PEA-BUG (*Bruchus pisi*, Linn.).—A small brown-black beetle, living in peas over winter. The beetle escapes in fall and spring and lays its eggs in

Pea (Pea-Weevil or Pea-Bug), continued.

young pea-pods, and the grubs live in the growing peas.

Preventive.—It is said that coal ashes or sand saturated with phenyl and sown with the peas will preven attack.

Remedies.—As soon as the mature peas are picked, and while the grubs are only partially grown, subject the peas to a temperature of 145° for an hour. The seed will not be injured. The ripe peas may also be confined in some tight receptacle, and a little bisulphide of carbon added.

Peach. APPLE-TREE BORER. See under Apple.

FLAT-HEADED BORER.—See under Apple.

KATYDID.—This insect is often troublesome to the peach in the southern states in early spring, eating the leaves and girdling young stems.

Remedy.—Poisoned baits placed about the tree.

PEACH-TWIG MOTH (*Anarsia lineatella*, Zeller).—The larva of a moth, a fourth inch long, boring in the ends of the shoots; it sometimes attacks the apple, and strawberry roots.

Remedy.—Burn the infested twigs.

PEACH-LOUSE or APHIS (*Myzus persicæ*, Sulzer).—A small insect feeding upon the young leaves, causing them to curl and die.

Remedies.—Kerosene emulsion. Soap and soda wash. Soap water. Soap and arsenites.

PLUM CURCULIO.—See under Plum.

PEACH-TREE BORER (*Ægeria exitiosa*, Say).—A whitish larva, about three-fourths inch long when mature, boring into the crown and upper roots of the peach, causing gum to exude.

Preventive.—Make a mound abont the tree in early summer, a foot high, and remove it in September; the moth then lays her eggs about the top of the mound, and the tender larvæ are killed by exposure to the weather. A coat of asbestos roofing applied about the base of the tree is recommended as a preventive. Apply washes as for

Peach (Peach-tree Borer), continued.

apple-tree borers. All preventives are unsatisfactory however, and the only safety is—

Remedy.—Dig out the borers in late fall and early spring.

RED-LEGGED FLEA-BEETLE (*Haltica rufipes*).—A flea-beetle feeding on the leaves of peach trees, often in great numbers.

Remedies.—The insects fall at once upon being jarred, and sheets saturated with kerosene may be used upon which to catch them. Spray with Paris green.

ROOT-KNOT.—See Root-knot.

ROSE BEETLE.—See under Rose and Apple.

Pear. APPLE-TREE BORER. See under Apple.

BUD MOTH.—See under Apple.

CODLIN MOTH.—See under Apple.

FLAT-HEADED BORER.—See under Apple.

PEAR-TREE BORER (*Ægeria pyri*, Harris).—A small whitish larva, feeding under the bark of the pear tree.

Remedy.—Same as for round-headed apple-tree borer.

PEAR-TWIG BEETLE (*Xyleborus pyri*, Peck).—Brownish or black beetle, one-tenth inch long, boring in twigs, producing effect much like pear-blight, and hence often known as "pear-blight beetle." It escapes from a minute perforation at base of a bud; probably two broods.

Remedy.—Burn twigs before the beetle escapes.

ROSE BEETLE.—See under Rose and Apple.

ROUND-HEADED BORER. See under Apple.

SLUG.—See under Cherry.

TWIG-GIRDLER (*Oncideres cingulatus*, Say.).—A brownish gray beetle, about one-half inch long, which girdles twigs in August and September. The female lays eggs above the girdle. The twigs soon fall.

Remedy.—Burn the twigs, either cutting them off or gathering them when they fall.

TWIG-PRUNER.—See under Apple.

Persimmon. TWIG-GIRDLER. See under Pear.

Pineapple. KATYDID (*Acanthacara similis*).—A large katydid which attacks, among other plants, the leaves of the pineapple.

Remedies.—Arsenites, before the plants are mature.

Plant-lice. See Aphides.

Plum. BUD MOTH. See under Apple.

CANKER-WORM.—See under Apple.

CURCULIO (*Conotrachelus nenuphar*, Herbst.).—Larva, a whitish grub, feeding in the fruit.

Remedies.—Arsenites, applied as soon as the calyx falls and repeat two or three times at intervals of about ten days. Plaster and carbolic acid mixture. Jarring the beetles on sheets very early in the morning, beginning when trees are in flower and continuing from four to six weeks. Catching beetles under chips or blocks about base of tree, the insects being taken very early in the morning.

FLAT-HEADED BORER.—See under Apple.

PEAR-TWIG BEETLE.—See under Pear.

PLUM-GOUGER (*Coccotoris scutellatis*, Sec.).—A small larva, feeding upon the kernel of the plum. The beetle bores a round hole in the plum, instead of making a crescent mark like the curculio.

Remedy.—Same as for curculio.

TWIG-PRUNERS.—See under Apple.

SLUG.—See under Cherry.

Poplar. COTTONWOOD LEAF-BEETLE (*Lina scripta*, Riley).—A striped beetle feeding on the leaves and shoots of poplars and willows.

Remedy.—Arsenites.

WILLOW-WORM.—See under Willow.

Potato. COLORADO POTATO-BEETLE (*Doryphora decemlineata*, Say).—Beetle and larva feed upon the leaves.

Remedies.—Arsenites. Hand-picking the beetle.

MOLE CRICKET (*Gryllotolpa borealis*, Burm.).—Mature insect, curiously formed, whitish, feeding on tubers in low and mucky ground.

Preventive.—Plant potatoes on upland.

Privet or Prim. PRIVET WEB-WORM (*Margarodes quadristigmalis*, Gn.).—Small larva feeding in webs on the young shoots of the privet, appearing early in the season; two to four broods.

Remedies.—Trim the hedge as soon as the worms appear and burn the trimmings. Attract the moths at night by lights. Probably the arsenites will prove useful.

Quince. ROUND-HEADED BORERS. See under Apples.

SLUG. See under Cherry.

Radish. MAGGOT (*Anthomyia raphani*, Harris).—Indistinguishable from the cabbage maggot, which see. Sowing copperas upon the soil before planting is sometimes adopted as a preventive of attack.

Raspberry. CANE-BORER (*Oberea bimaculata*, Oliv.).—Beetle, black, small and slim; making two girdles about an inch apart near the tip of the cane, in June, and laying an egg just above the lower girdle; the larva, attaining the length of nearly an inch, bores down the cane. Also in the blackberry.

Remedy.—As soon as the tip of the cane wilts, cut it off at the lower girdle and burn it.

RASPBERRY ROOT-BORER (*Bembecia marginata*, Harris).—Larva about one inch long, boring in the roots, and the lower parts of the cane, remaining in the root over winter.

Remedy.—Dig out the borers.

RASPBERRY SAW-FLY (*Selandria rubi*, Harris).—Larva about three-fourths inch long, green, feeding upon the leaves.

Remedy.—Hellebore.

ROOT GALL-FLY (*Rhodites radicum*, Sacken).—A small larva which produces galls, sometimes attaining two inches in diameter, on the roots of the raspberry, blackberry and rose, causing the bush to appear sickly, and eventually killing it.

Remedy.—There is no remedy except to destroy the galls; if plants are badly affected they must be dug up, and burned.

Raspberry, continued.

SNOWY OR TREE CRICKET (*Œcanthus niveus*, Serv.).—Small and whitish cricket-like insect, puncturing canes for two or three inches, and depositing eggs in the punctures.

Remedy.—Burn infested canes in winter or very early spring.

Red Spider (*Tetranychus telarius*, Linn).—A small red mite infesting many plants, both in the greenhouse and out of doors. It flourishes in dry atmospheres, and on the under side of the leaves.

Remedies.—Persistent syringing with water will destroy them, if the spray is applied to the under surface. Fumes of sulphur. Sulphide of soda wash.

Root-Knot. A disease characterized by the knotting and contortion of the roots of the peach, orange and many other plants. It is usually most destructive on the peach. It is caused by a nematode, or true worm. Gulf States.

Preventives.—Plant non-infested trees in fresh soil; bud into healthy stocks. Fertilize highly, particularly with potassio fertilizers. Set the trees eight or ten inches deep in high and dry soils. Infested small trees may be remedied, in part at least, by transplanting them into highly-manured holes which have been prepared contiguous to them.

Rose. ROOT GALL-FLY. See under Raspberry.

MEALY-BUG. On roses, a gill of kerosene oil to a gallon of water is a good remedy. Syringe the plants in the morning, and a couple hours later syringe again with clean water. See also under Mealy-bug.

ROSE BEETLE, ROSE CHAFER or "ROSE-BUG" (*Macrodactylus subspinosus*, Fabr.).—Beetle three-fourths inch long, light brown, feeding upon the leaves, blossoms and fruit.

Remedies.—Hand-picking. Knocking off on sheet early in morning. Pyrethrum. Eau celeste. It is said to prefer Clinton grapes to most other plants, and it has been suggested that these vines be planted as a decoy. Open

Rose (Rose Beetle), continued.

vials of bisulphide of carbon hung in bushes and vines are recommended by some.

ROSE-LEAF HOPPER (*Tettigonia rosæ*).—Hopper, very small, white, often mistaken for thrips; lives on the leaves of roses. Various stages of growth may be found in the leaves throughout the summer, and even on indoor plants.

Remedies.—Whale oil soap. Kerosene. Nicotyl vapor Infusion of tobacco. Kerosene and water emulsion. Pyrethrum. The insect is easily destroyed when in its immature state.

ROSE SLUG (*Selandria rosæ*, Harris).—Larva, one-half inch long, dull and slimy, feeding upon the leaves.

Remedy.—Kerosene emulsion.

Scale.—Various small scale-like insects infesting the young branches and leaves of many kinds of trees. The orange tree scale is one of the worst. (See under Orange.)

Remedies.—Kerosene emulsion. Lye wash. Lye and sulphur wash. Pyrethrum decoction. Resin soap. Oil and alkali wash. Salt and lime wash. Resin and fish-oil soap. Sulphide of soda wash.

Smoke-tree. JUMPING SUMAC BEETLE. See under Sumac.

Squash. BUG (*Anasa tristis*, De Geer).—Bugs, black, very offensive odor when handled or crushed; many broods.

Remedies.—Plaster and kerosene. Hand-picking. Trapping, by laying blocks about the hills under which the bugs will collect after feeding in the night; early in the morning jar or brush the insects into a pail of kerosene. A mild kerosene emulsion kills the young insects.

MELON-WORM.—See under Melon.

SQUASH-VINE ROOT-BORER (*Ægeria cucurbitæ*, Harris).—Larva, about one inch long, whitish, boring into the roots, causing the vines to perish.

Remedy.—Bank up the young vines as far as the blossoms. Cover some of the joints of the vine, that roots may form to sustain the plants, in case of injury.

Squash, continued.

SPOTTED CUCUMBER BEETLE.—See under Cucumber.

STRIPED CUCUMBER BEETLE.—See under Cucumber.

Strawberry. GRUB or MAY-BEETLE. See under May-beetle.

STRAWBERRY LEAF-ROLLER (*Phoxopteris comptana*, Frol.).—Larva, less than one-half inch long, feeding on the leaves, and rolling them up in threads of silk; two broods.

Remedies.—In first stage of attack apply hellebore Burn the leaf-cases.

STRAWBERRY ROOT-LOUSE (*Aphis Forbesii*, Weed).—From July to the close of the season the lice appear in great numbers on the crowns and in the roots of the plants.

Remedies.—Rotation in planting. Disinfect plants coming from infested patches by dipping the crowns and roots in kerosene emulsion.

STRAWBERRY ROOT-BORER (*Anarsia lineatella*, Zeller).—Larva, about one-half inch long, whitish, boring into the crown of the plant late in the season and remaining in it over winter.

Remedy.—Burn the plant.

STRAWBERRY SAW-FLY (*Emphytus maculatus*, Norton).—Larva, nearly three-fourths inch long, greenish, feeding upon the leaves; two broods.

Remedy.—Hellebore. Arsenites for second brood.

WEEVIL (*Anthonomus musculus*, Say).—Beetle, one-tenth inch long, reddish, feeding on young fruit.

Remedies.—Plaster and crude carbolic acid mixture.

Sumac. APPLE-TREE BORER. See under Apple.

JUMPING SUMAC BEETLE (*Blepharida rhois*, Forst.).—Larva, half inch long, dull greenish-yellow, feeding on leaves; two broods.

Remedy.—Arsenites.

Sweet Potato. SAW-FLY (*Schizocerus ebenus*, Norton).—Small larva about one-fourth inch long, working upon the leaves. The fly is about the size of a house-fly.

Remedies.—Hellebore and pyrethrum are to be recommended; also arsenites.

Tomato. FRUIT-WORM (*Heliothis armiger*, Hub.).—Larva, one inch in length, pale green or dark brown, faintly striped, feeding upon the fruit. Also on corn and cotton.

Remedies.—Hand-picking. White hellebore.

TOMATO RINGER (*Stictocephala festina*, Say).—A leaf-hopper which injures the stem of the young tomato plant by puncturing it in a ring. Southward.

No remedy is known.

TOMATO-WORM (*Macrosila quinquemaculata*, Haw.).—A very large green worm feeding upon the stems and leaves of the tomato and husk tomato.

Remedy.—Hand-picking.

Turnip. MAGGOT. See under Cabbage.

Weigelia. FOUR-STRIPED PLANT-BUG. See under Currant.

White ants, or Termites.—These insects often infest orchard trees in the Southern states, particularly in orchards which contain old stumps or rubbish.

Remedy.—The soap and arsenites wash brushed over the trunk and branches of the trees.

Willow. WILLOW-WORM (*Venessa antiopa*, Linn.).—Larva, nearly two inches long, black, feeding upon leaves of willow, elm and poplar; two broods.

Remedy.—Arsenites.

Wire-worm (*Various species*).—Slim and brown larvæ, feeding upon the roots of various plants. They are the larvæ of the click-beetle or snapping-beetle.

Remedy.—Arsenites sprinkled upon baits of fresh clover or other material which is placed about the field under blocks or boards. Sweetened corn-meal dough also makes a good bait.

CHAPTER III.

Fungicides, for Plant Diseases.

Ammoniacal carbonate of copper.—Into a vessel having a capacity of 2 qts. or more pour 1 qt. of ammonia (strength 22 degrees Baumé), add 3 ozs. carbonate of copper. Stir rapidly for a moment and the carbonate of copper will dissolve in the ammonia, forming a very clear liquid. The concentrated liquid thus prepared may be kept indefinitely. For use, dilute to 22 gals. For grape mildew.

Blight powder, Sulphated sulphur.—Prepared by thoroughly mixing from 3 to 8 lbs. of anhydrous sulphate of copper with 90 to 100 lbs. of flowers of sulphur. For simultaneous treatment of downy mildew, tomato and potato blight and rot.

Bordeaux mixture (*Copper mixture of Gironde*).—Dissolve 6 lbs. of sulphate of copper in 16 gals. of water. In another vessel slake 4 lbs. of fresh lime in 6 gals of water. When the latter mixture has cooled it is slowly poured into the copper solution, care being taken to mix the fluids thoroughly by constant stirring. Prepare some days before use. Stir before applying. Stronger mixtures were at first recommended, but they are not now used. For downy mildew and black-rot of the grape, blight and rot of the tomato and potato.

Sometimes the mixture is not washed off the grapes by the rains. In this case, add one quart of strong cider vinegar to 5 gals. of water, and dip the grapes, allowing them

Bordeaux mixture, continued

to remain a few minutes, then rinse once or twice. Dip the grapes by placing them in a wire basket.

Carbolic acid (*Phenic acid*).—1. ½ pt. in 10 gals. of water. For powdery mildew of the vine.

2. Soap-suds, 10 gals.; glycerine, 1 lb.; carbolic acid, ½ pt. Mix thoroughly, to form an emulsion. For orange-leaf scab.

Chloride of iron.—A very dilute solution of chloride of iron has been used with success in combating the coffee disease due to *Hemileia vastatrix*. The solution is applied to the under surface of the leaves by means of a pulverizator or spraying apparatus. Its sticky nature causes it to adhere for two months. It is suggestive in connection with some of our plant diseases.

David's powder.—Dissolve 4 lbs. of sulphate of copper in the least possible amount of hot water, and slake 16 lbs. of lime with the smallest quantity of water required. When the copper solution and slaked lime are completely cooled mix them together thoroughly; let the compound dry in the sun, then crush and sift. Apply with a sulphuring bellows furnished with an outside receptacle for the powder. For downy mildew and black-rot of the grape, mildew and anthracnose.

Destroying affected parts.—It is important that all affected parts should be removed and burned, if possible. In the fall all leaves and fruit which have been attacked by fungi should be raked up and burned. Diseased branches should be severed at some distance below the lowest visible point of attack. Fungous diseases often spread rapidly, and prompt action is usually necessary.

Eau celeste.—1 (*Audoynaud process*). Dissolve 1 lb. of sulphate of copper in 2 gals. of hot water. When completely dissolved and the water has cooled, add 1½ pts. of commercial ammonia (strength 22 degrees Baumé). When ready to use, dilute to 22 gals. For treatment of downy

Eau celeste, continued.

mildew and black-rot of the grape, anthracnose, and blight and rot of the tomato and potato.

2. Dissolve 1 lb. of sulphate of copper in 2 gals. of water. In another vessel dissolve 1 lb. of carbonate of soda. Mix the two solutions. When chemical reaction has ceased, add 1½ pts. of ammonia, then dilute to 22 gals. For the same purpose as No. 1, and probably better.

Grison liquid (*Eau Grison*).—Prepared by boiling 3 lbs. each of flowers of sulphur and lime in 6 gals. of water until reduced to two gallons When settled, pour off the clear liquid and bottle it. When used, mix 1 pt. of clear liquid in 100 parts of water. For mildew and powdery mildew of vines.

Milk of lime.—Simple solution in water, 2 to 6 parts lime to 100 parts water. For mildew and anthracnose.

Podeschard's powder.—Dissolve 45 lbs. of sulphate of copper in water. When thoroughly dissolved, pour the solution upon 225 lbs. of air-slaked lime, which is surrounded by 30 lbs. of ashes to keep the liquid from spreading. After 24 hours, add 20 pounds of flowers of sulphur. Thoroughly mix the compound, ashes and all. When dry sift through a sieve with meshes of one-eighth inch. Will keep for months. For downy mildew, mildew and anthracnose.

Potassium sulphide.—Used at the rate of ½ or ¼ oz. to the gal. of water.

Skawinski's powder.—Mix 22 lbs. of finely powdered sulphate of copper with 33 lbs. of soot or alluvial earth and 165 lbs. of coal dust. For treatment of mildews.

Skawinski's sulphate of iron and sulphuric acid solution.—Sulphate of iron, 110 lbs.; sulphuric acid (53 degrees), 1½ pts.; warm water, 22 gals. Pour sulphuric acid on the crystals of iron, then add the water. Use while warm.

Soda hyposulphite.—1. ½ oz. to 10 gals. of water. For gooseberry mildew and apple scab.

2. 1 lb. in 10 gals. of water. For celery-leaf blight, orange-leaf blight, apple scab. Should be used as soon as prepared. Probably too strong.

Sulfosteatite or **Cuprique steatite.**—An exceedingly fine bluish powder composed of steatite, or talc, and about 10 per cent. of sulphate of copper. Considered the most adherent of all fungicide powders. For mildews.

Sulphate of copper.—1. Dissolve 1 lb. of pure sulphate of copper in 25 gals. of water. For treatment of downy mildew and black-rot of the grape. Dilute it a little for young foliage.

2. Dissolve 5 to 8 lbs. in 10 gals. of water. For soaking grains previous to sowing to destroy spores of smuts. The Germans use a ½ per cent. solution, and soak the grains for about 16 hours.

Sulphate of iron.—1. Simple solution in water of 4 to 8 lbs. to the gal. To be used only as a wash. For anthracnose of vine and raspberry.

2. For a spray, dissolve about 1¼ lb. to the gal.

Sulphatine, the Esteve process.—Mix 2 lbs. of anhydrous sulphate of copper with 20 lbs. of flowers of sulphur and 2 lbs. of air-slaked lime. For mildew, downy mildew and black-rot of grape, tomato and potato blight and rot.

Sulphide, or sulphuret, of potassium (*Liver of sulphur*).—Simple solution in water of ¼ to 1 oz. to the gal. For mildew in greenhouses, mildew on roses, erinose of vine, orange-leaf scab, celery-leaf blight, pear and apple scab and various rots.

Sulphide of soda wash (*Hilgard's*).—Dissolve 30 lbs. of whale-oil soap in 60 gals. of water by heating the two together thoroughly. Then boil 3 lbs. of American concentrated lye with 6 lbs. of sulphur and 2 gals. of water. When thoroughly dissolved it is a dark brown liquid,

Sulphide of soda wash, continued.

chemically called sulphide of soda. Mix the two—the soap and the sulphur—well, and allow them to boil for half an hour, then add 90 gals. of water to the mixture, and it is ready for use. Apply it warm by means of a spray pump. Used warm, its effect is better and less material is required than when cold. For apple scab.

Sulphur.—In its dry and pulverized state, sulphur, known as flowers of sulphur, is often a valuable fungicide, particularly for surface mildew. In the greenhouse it may also be used in fumes. Evaporate it over a steady heat, as an oil stove, until the house is filled with the vapor. It should never be heated to the burning point, as burning sulphur quickly destroys most plants. It may also be used in water, in the proportion of an oz. of sulphur to 5 gals. of water.

Sulphur and lime.—A mixture of sulphur and lime in equal parts by weight. For anthracnose during growing season.

Some fungicides may be added to London purple or Paris green mixtures, and both plant diseases and insects may be fought with one application. An ounce of the arsenites to ten gallons of Bordeaux mixture is recommended for potatoes. The arsenites may be combined with soda hyposulphite, and other compounds

CHAPTER IV.

Plant Diseases,

WITH PREVENTIVES AND REMEDIES.

Apple. Bitter-rot (*Glœosporium fructigenum*, Berk.).—A dry rot appearing in patches on many varieties of apples, and extending some distance into the tissue.

No remedies or preventives are known.

Brown-rot.—See under Cherry.

Powdery Mildew (*Podosphœra oxycanthæ*, DeBary).—Attacks nursery stocks, covering leaves with a grayish and powdery meal-like mildew.

Remedy.—Ammoniacal carbonate of copper, applied four or five times.

Rust (species of *Rœstelia*).—Bright yellow rust appearing on the young leaves and fruit, causing the whole tree to become enfeebled. It is now known that one stage of this fungus is the "cedar apple" which grows on red cedars and junipers, where it is known as *Gymnosporangium*. Several species have been described.

Preventive.—Destroy the cedars or keep them free from the "apples." Destroy hawthorns and escaped apples, which are liable to be infested. Some varieties of apples appear to be more susceptible to injury than others.

Scab (*Fusicladium dentriticum*, Fckl.).—Brown or blackish scab-like spots on the leaves and fruit, arresting growth and causing the parts to become distorted.

Remedy.—Spray with soda hyposulphite or potassium sulphide, several times during June and July. Sulphide of soda wash.

Apricot. Leaf-rust. See under **Plum.**

Balm of Gilead. LEAF-RUST. See under Poplar.

Bean. ANTHRACNOSE, or POD-RUST (*Glœosporium Lindemuthianum*, Sacc. and Magn.).—Reddish-brown scab-like spots appearing upon bean pods, particularily upon the yellow-podded string beans. It also attacks water-melons.

Preventive.—Plant in dry and airy places, on light soil.

Remedy.—Sulphur and water.

Bean, Lima. BLIGHT (*Phytophthora Phaseoli*, Thaxter).—Attacks the pods in August and September, covering them with a white, felted coating. It also attacks the young shoots and leaves.

Remedy.—Remedies are not yet known, but the Bordeaux mixture should be tried.

Beet. RUST (*Uromyces betæ*, Pers.).—Powdery reddish-brown spots on the leaves of beets in California, often doing much injury.

Remedy.—Burn the infested leaves.

Blackberry. CANE-RUST. See under Raspberry.

RED OR ORANGE RUST. See under Raspberry.

Buttonwood. LEAF-SCORCHING. See under Plane-tree.

Cabbage. CLUB-ROOT or CLUB-FOOT (*Plasmidiophora brassicæ*, Woronin).—A cortorted swelling of the root of the cabbage in the field, preventing the plant from heading and causing it to assume a sickly appearance.

Remedies.—Burn the roots as soon as the disease appears. Alternate crops. It is thought that stable manures aggravate the disease.

Carnation. RUST (*Septora Dianthi*, Desm.).—Attacks the leaves in large, light brown spots, or occasionally the whole leaf becomes discolored and wilts. Probably introduced from Europe.

Preventives.—If the disease is feared, be careful not to apply water to the leaves. Eau celeste sprayed upon the plants will no doubt be beneficial as a preventive. Burn all infested leaves.

Celery. CELERY-LEAF BLIGHT, RUST, OR SUN-SCALD (*Cercospora Apii*, Fries). Appears in hot and dry places and seasons, about mid-summer. Small yellowish spots appear upon the leaves, and later the leaves turn yellow, then brown, and finally die.

Preventive.—Plant in a moist and cool place, and shade the plants if necessary. Destroy all diseased leaves in autumn.

Cherry. BROWN-ROT (*Monilia fructigena*, Pers.).—Attacks flowers, leaves and fruit. The flowers die and decay, the leaves become discolored with brownish patches and the fruit rots on the tree. Attacks also peaches, plums and apples.

Remedies.—Burn all infested fruit and leaves in the fall. Before buds expand in spring spray with sulphate of iron When the flowers are opening, spray again with sulphide potassium, and repeat the operation at intervals of a week or two until the fruit begins to color.

LEAF-RUST. See under Plum.

POWDERY MILDEW. See under Apple.

Corn. ROT. Due to bacteria. The plants are dwarfed, and unusually slender. The roots become mucilaginous and decay, as do the leaf-sheaths and the ears.

No remedies or preventives are known

SMUT. (*Ustilago Zeæ-Mays*, DeC.).—A fungus attacking the ears of corn, producing familiar black abnormal growths.

Preventive.—Plant seed from clean fields.

Remedies.—Cut out smut and burn it. Soak seed before planting in sulphate of copper.

Cottonwood. LEAF-RUST. See under Poplar.

Currant. RUST (*Septoria Ribis*, Desm.).—Appears about mid-summer, on leaves of white, red and black currants, as whitish spots with black centers. It causes the leaves to fall.

Remedies.—Destroy infested leaves. Spraying with eau celeste or Bordeaux mixture may be tried.

Gooseberry. MILDEW (*Sphærotheca Mors-uvæ*, B. & C.).—A downy mildew attacking the fruits and young growth of English varieties of gooseberries (varieties of *Ribes Grossularia*).

Remedy.—Spray at intervals during the season with potassium sulphide.

Grape. ANTHRACNOSE or SCAB (*Sphaceloma ampelinum*, DeBary).—The fungus attacks the leaves in small spots, and also the fruit, where it forms hard and sunken brown or black large scab-like patches. General in distribution east of the Mississippi. Probably introduced from Europe.

Remedies.—Sulphur fungicides, as sulphur, sulphate of iron, eau celeste. Repeat application frequently and begin before the leaves appear.

BLACK-ROT (*Læstadia Bidwellii*, V. & R.; *Phoma uvicola*, B. & C.).—Attacks the young berries. The fruit becomes black, hard, dry, and shrivelled and is covered with minute pimples. Occurs generally east of the Rocky Mountains. Of American origin.

Preventive.—A board placed over the trellis, as mentioned under the downy mildew, is some protection; but the remedy is certain:

Remedies.—Spray thoroughly with Bordeaux mixture every week or ten days for six weeks or more, beginning before the flowers open. Sulphate of copper may be used also. Burn infested fruits in autumn.

NOTE.—The following are synonyms for Black-rot: *Sphœria Bidwellii*, *Physalospora Bidwellii*, *Phoma uvicola*, *Phoma uvicola*, *var. Labruscæ*, *Sphæropsis uvarum*, *Phoma uvarum*, *Nemaspora æmpelicida*, *Phyllosticta Labruscæ* ("the leaf-spot" form), *Phyllosticta viticola*, *Phoma ustulatum*. *Phyllosticta ampelopsidis*, *Sacidium viticolum*, *Septoria viticola*, *Ascochyta Ellissii*.

DOWNY MILDEW (*Peronospora viticola*, De Bary).—Appears in small frost-like patches on the under surface of the

Grape (Downy Mildew), continued.

leaves, finally causing yellowish discoloration on the upper surface. It also causes a rot of the fruit. The berries remain small and firm, usually not wrinkled, and become brown in color. The disease is worst on thin and smooth leaved varieties, as the Delaware and others. It extends generally throughout the Union. Of American origin.

Preventive.—A wide board nailed flatwise on the top of the trellises so as to somewhat protect the vines, as with a roof, is a considerable protection, as it tends to keep the vines dry. Vines trained against a building rarely suffer.

Remedies.—Spray with Bordeaux mixture every week or ten days from the time the leaves appear until late in July. Eau celeste may be used.

POWDERY MILDEW (*Uncinula spiralis*, B. & C.).—Appears early in the season as delicate dust-like patches or covering on the leaves, mostly on the upper surface, and on shoots and fruits. Berries attacked by it become checked in growth, and may remain small and die, or they sometimes grow and crack before death ensues. It attacks grapes in vineries which are not properly ventilated and managed. Occurs generally throughout the Union, but is less destructive than the downy mildew American origin.

Remedy.—Dry sulphur applied to the vines, two or three times—once when the shoots just begin to push again when in blossom, and usually again shortly before the grapes begin to turn. Apply in warm and bright weather, after the dew is off. In vineries, the sulphur may be scattered on the hot pipes.

Hollyhock. RUST (*Puccinia Malvacearum*, Mont.).—Appears upon leaves of hollyhocks and a few related plants in small, light brown patches. Introduced from Europe, and not yet common in this country.

Remedies.—Destroying the plants is the only general method yet known to prevent the spread of the disease but some of the fungicides should be tried.

Lettuce. MILDEW (*Peronospora gangliformis*, De Bary). A delicate mildew, attacking lettuce leaves and causing yellow or brown spots, and finally killing the leaf.

Preventives.—(According to Maynard.) Grow at a low temperature (35° to 40° at night, 50° to 70° during day); give abundance of plant food; give abundance of water, but apply it in morning and bright days only; avoid sudden extreme changes of temperature.

Remedy.—Fumes of sulphur.

Maple. LEAF-SPOT (*Phyllosticta acericola*, C. & E.).—Attacks the leaves of red, silver, and striped maples in spring, causing them to become spotted and unsightly, and lessening the vigor of the tree.

Remedies.—Rake and burn the leaves in autumn. When the leaves are two-thirds grown spray with sulphide of potassium, and repeat every three or four weeks as long as necessary.

Onion. RUST (*Peronospora Schleideniana*, Unger). The leaves turn yellow about the time the onions begin to bottom, or a little later, and wilt and die.

Preventive.—There is no remedy known. Exercise care to grow on land not infected, and destroy all affected onions.

Orange. ORANGE-LEAF SCAB (*Cladosporium*).—The leaves become yellow and distorted.

Remedy.—Spray with Grison liquid, or carbolic acid and glycerine mixture.

Peach. BROWN-ROT. See under Cherry.

CURL, LEAF-CURL OR "FRENCHING," (*Taphrina deformans*, Tul.; written also *Ascomyces deformans* and *Exoascus deformans*).—The leaves become blistered and crumpled early in the season and fall off.

Remedy.—It seldom does much damage, and the trees usually renew their foliage the same season. Good culture, to enable the tree to put forth new leaves, is to be recommended.

Peach, continued.

LEAF-RUST. See under Plum,

POWDERY MILDEW. See under Apple.

YELLOWS.—The first symptom in bearing trees is usually the premature ripening of the fruit. This fruit contains definite small red spots which extend to the pit. The next stage is indicated by very slender shoots, which branch the first year and which start in clumps from the old limbs, bearing narrow and small yellowish leaves. Later the entire foliage becomes smaller and yellow. In three or four years the tree dies. The disease spreads from tree to tree. It attacks trees of any age. Known at present only in regions east of the Mississippi, more particularly in the north-eastern states. Peculiar to America, so far as known.

Preventive.—Burn all trees as soon as the disease appears. Laws aiming to suppress the disease should be enacted in all peach-growing states where it has appeared.

Pear. BLIGHT (*Micrococcus amylovorus*, Burrill).—Distinguished by the blackening of the entire leaf, and the blackening of the bark. It may destroy branches or the whole tree. Generally distributed east of the 100th meridian. Known only in America.

Remedy.—As soon as the disease is discovered, cut off the affected parts a foot below the point of lowest visible attack, and burn them.

LEAF-BLIGHT and CRACKING OF THE FRUIT (*Entomosporium maculatum*, Lev.; *Morthiera Mespili* is the same).—Attacks nursery stocks of pears, beginning as small and circular brown spots on the leaves; soon the entire leaf turns brown and falls. Also causes the cracking of the fruit.

Remedy.—Bordeaux mixture, applied four or five times.

ROOT-ROT (*Polyporus versicolor*, Fries).—Attacks the roots, the white and felt-like threads of the fungus at length becoming very abundant and conspicuous. The trees produce a short and thick growth, the new wood being

Pear (Root-rot), continued.

reddish, the leaves becoming yellowish or bronzed, and there is an unusual tendency to form fruit buds. The tree may die quickly or may live for several years. The roots rot away and the tree tips over. The disease is worst on poor and dry soils and in grassy orchards.

Remedy.—Give good culture. Remove the earth from the crown and apply a dressing of lime.

RUST.—See under Apple.

SCAB (*Fusicladium pyrinum*, Fckl.).—Brown or blackish scab-like spots on the leaves and fruit, arresting the growth and causing the parts to become distorted.

Remedy.—Spray several times during June and July with soda hyposulphite or potassium sulphide.

Plum. BROWN-ROT. See under Cherry.

LEAF-RUST (*Puccinia pruni-spinosæ*, Pers.).—Small round powdery spots of yellowish-brown on the under surface of the leaves, and reddish spots on the upper surface directly above them.

Remedy.—Spray trees early in the season with Bordeaux mixture, eau celeste, or other fungicides.

PLUM-KNOT OR PLUM-WART (*Plowrightia* [*Sphæria*] *morbosa*, Sacc.).—A black and irregular swelling, from one to five or six inches long, appearing on the small limbs of plum and cherry. Peculiar to America.

Remedies.—Burn all affected parts. Wash the parts as soon as the swelling begins to appear, with linseed oil, turpentine, or kerosene, using the two latter with caution. A paint of red oxide of iron in linseed oil is recommended. Probably spraying with the Bordeaux or similar mixtures in spring will prove to be valuable remedies.

PLUM-LEAF OR SHOT-HOLE FUNGUS (*Septoria cerasina*, Peck).—Appears as spots upon the leaves in July, and these spots assume definite outlines, and often fall out, leaving holes like shot-holes. The leaves fall early, pre-

Plum (Plum-leaf or Shot-hole Fungus), continued. venting the fruit from maturing. The disease is sometimes designated simply "falling of the leaves."

Remedies.—Burn leaves as soon as they fall. Try spraying in May and June with some fungicide, as soda hyposulphite or Bordeaux mixture.

PLUM POCKETS OR BLADDERS (*Taphrina pruni*, Tul.).—Causes the fruit to become inflated and hollow. These "bladders" begin to appear soon after the flowers fall, and continue to grow for several months, when they fall. They are at first globular, but finally become oblong, often reaching two inches in length. The fungus attacks the fruit of the Chickasaw and American plums, and various species of plum and cherry.

Remedy.—Destroy the "bladders" before they mature, together with small portions of the wood on which they are borne.

POWDERY MILDEW. See under Apple.

Plane-tree. LEAF-SCORCHING (*Glœosporium nervisequum*, Sacc.).—Attacks the leaves in spring, causing them appear as if scorched. They finally fall off. Attacks both the native and oriental planes.

Remedy.—Burn all leaves when they fall.

Poplar. LEAF-RUST (*Melampsora populina*, Lév.).—An orange rust attacking, during summer, the leaves of various species of poplar, including the cottonwood, balm of Gilead, etc,

Remedy.—Rake and burn the leaves.

Potato. POTATO-ROT OR BLIGHT (*Phytophthora infestans*, De Bary).—The spores first germinate upon the tops or vines, causing the foliage to blight. The disease soon spreads to the tubers, causing discolored and depressed potatoes. It is a "dry rot," but other fungi attack the tubers and cause the wet rot which follows. The fungus may remain in the tuber during winter.

Preventive.—Plant on light or loamy, well-drained soil. Plant only sound and disinfected tubers. Hill deep.

Potato (Potato-rot or Blight), continued.

Remedy.—Spray the tops with Bordeaux mixture, or other fungicide, upon the first indication of the blight.

The tubers should be stored in a cool and dry place Dusting them in the cellar with dry air-slaked lime is to be recommended. Subjecting the tubers to a temperature of 105° to 110° for a few days will destroy the fungus and will not injure the tubers for planting.

Quince. LEAF-BROWNNESS (*Entomosporium maculatum*, Lév., var. *Cydoniæ*, Sacc.).—The leaves become spotted and then turn yellow and fall, often causing considerable damage. No remedies are known. It is nearly identical with leaf-brownness of the pear (which see).

RUST.—See under Apple.

Raspberry. CANE-RUST or ANTHRACNOSE (*Glœosporium necator*, E. & E.).—The spots or patches of fungus appear on both the canes and leaves. The disease attacks the base of the canes first and spread upwards. In Illinois and Missouri it has been very destructive.

Preventive.—Give plants an abundance of light and air by broad planting and high training.

Remedy.—Spray early in the season with sulphate of iron, and follow later with Bordeaux mixture. Burn all canes which are past recovery.

RED or ORANGE RUST (*Cæoma luminatum*, Link).—Attacks the under surface of the leaves of black and sometimes red raspberries, and of blackberries, in patches of whitish yellow, but the fungus finally covers the whole under surface with an orange-red coating.

Preventive.—Plant such varieties as are least susceptible to attack. Among blackberries, Kittatinny is particularly susceptible.

Remedy.—Burn the plants, roots and branch, as soon as the disease appears.

Rose. LEAF-BLIGHT or BLACK-SPOT (*Actinonema rosæ*, Fries).—Attacks the full-grown leaves, first appearing as

Rose (Leaf-blight or Black-spot), continued.

small black spots, but later covering nearly or quite the whole surface with blotches. The spots have frayed edges Common in out-door and house culture.

Remedies.—In the house, fumes of sulphur. Out of doors, burn the affected leaves and spray with Bordeaux mixture or eau celeste. Spray before the leaves unfold.

LEAF-SPOT (*Cercospora rosæcola*, Pass.).—Black or reddish-black spots on the leaves, shading into red at the definite edges. Later the center of the spot becomes light brown or gray. Attacks plants growing out of doors.

Remedies.—Burn diseased parts. Plant in an airy and dry place.

MILDEW (*Sphærotheca pannosa*, Lév.).—Whitish mildew attacking roses. It is brought on, according to Maynard, by exposure to drafts of extremely cold air when the plants are growing rapidly, by high temperature running the same day and night, by watering just before night, by too little water, by extreme dryness, by poor drainage, by deficiency in plant food.

Remedy.—Fumes of sulphur.

RUST (*Phragmidium mucronatum*, Winter). — Appears in small and scattered bright yellow spots or pustules on the leaves, which at length become distorted, and upon the young growth.

Preventive.—Spray with eau celeste early in the season.

Remedy.—Spray with sulphate of copper or other fungicides.

Strawberry. MILDEW (*Spærotheca Castagnei*, Lév.)—A whitish cobweb-like mildew spreading over the fruit and leaves.

Remedy.—If the disease is discovered early enough, some liquid fungicide, as potassium sulphide or Bordeaux mixture, should be employed.

STRAWBERRY-LEAF BLIGHT or "SUN-BURN" (*Sphærella fragariæ*, Sacc., including *Ramularia.*)—Small purple

Strawberry (Strawberry-leaf Blight), continued.

or red spots appearing on the leaves. They eventually become larger and browner, making the leaf appear blotched.

Remedies.—Spray the plants several times early in the season with solution of potassium sulphide. Destroy all affected leaves. The leaves are easily destroyed without injury to the plants by burning off a thin layer of straw which is spread over the patch after the fruit is off.

Tomato. BLIGHT (*Cladosporium fulvum*, Cooke).—Soft brown irregular spots appear on the under surface of the leaves, and the upper surface becomes spotted with yellow. The leaves finally shrivel. Most serious in greenhouses.

Preventive.—In houses, keep the temperature as even as possible. In particular, avoid sudden changes.

Remedy.—Sulphide of potassium sprayed on the plants every week or ten days.

ROT.—(Several fungi appear to be concerned in the production of tomato rot, and the subject is not yet well understood.)

Preventive.—The small cherry and plum tomatoes are not attacked, and the old-fashioned angular sorts are comparatively free. Training the vines so as to give the fruit plenty of light and air is usually useful. Heavy applications of fresh stable manure appear to augment the injury. Burn all infested vines and fruits in the autumn.

Verbena. RUST (*Erysiphe Cichoracearum*, D. C.).—A rust which appears on the leaves, eventually destroying the plants.

Preventives.—Start with perfectly healthy and vigorous stock, and give good culture. In the house, endeavor to avoid drafts, but give plenty of air on bright days.

Violet. VIOLET DISEASE OR RUST (*Peronospora Violæ*,

Violet (Violet Disease), continued.

De Bary ?).—Appears on the leaves as small rounded black or brown spots, causing the leaf to finally wither and die.

Preventives.—It is supposed that any neglect or improper handling renders the plants more liable to the disease. Burn all infested plants, and do not use the same soil again for violets.

Watermelon. ANTHRACNOSE or POD-RUST. See under Bean.

CHAPTER V.

Injuries from Mice, Rabbits, Squirrels and Birds, with Preventives and Remedies.

To prevent mice from gridling trees in winter.—In heeling-in young trees in the fall, do not use straw or litter, in which mice can make their nests. In orchards, see that tall grass, corn husks, or other dry material does not gather about the trees in fall. If danger from mice is apprehended, tramp the first snow firmly about the trees, in order to compact the grass and litter so that mice cannot find shelter. Where the paper birch grows, it will be found a good plan to place sections of birch bark from limbs or small trunks about the base of the tree. These sections roll up tightly about the tree, and yet expand so readily with the growth of the tree that they may be allowed to remain. Tie thin strips of wood, as laths or shingles, about the tree.

Washes to protect trees from mice.—Wash the trees with some persistent substance in which is placed Paris green. Maynard finds the following substances useful for holding the poison: Portland cement of the consistency of common paint; Portland cement 10 parts and gas tar 1 part; Portland cement 10 parts and asphaltum 1 part; Portland cement 10 parts and Morrill's tree ink 1 part.

Lime wash, to which is added a little sulphur, tobacco decoction, and soap-suds.

Carbonate of baryta for rats and mice.—Sugar and oatmeal or wheat flour, of each 6 ozs.; carbonate of baryta,

Carbonate of baryta for rats and mice, continued.

¼ lb.; oil of anise seed, enough to give the mixture a pretty strong odor.

Tartar emetic for rats and mice.—Tartar emetic, 1 part oatmeal or flour, 4 parts; beef or mutton suet enough to make all into a paste.

Camphor for rats and mice.—Mix a few pieces of camphor with vegetable seeds, to preserve them.

French paste for rats and mice.—Oatmeal or wheat flour, 3 lb.; powdered indigo, ½ oz.; finely powdered white arsenic, 4 ozs.; oil of anise seed, ½ drachm. Mix, and add of melted beef suet or mutton tallow 2½ lbs., and work the whole up into a paste.

Wash for keeping rabbits, sheep and mice away from trees.—Fresh lime, slaked with soft water (old soap suds are best); make the wash the thickness of fence or house wash. When 1 peck of lime is used, when hot add ½ gallon crude carbolic acid, ½ gallon gas-tar and 4 pounds of sulphur. Stir well. For summer wash leave gas-tar out, and add in place of it 1 gallon of soft soap. To keep rabbits and sheep from girdling, wash late in fall, or about the time of frost, as high as one can reach.

To remedy the injury done by mice and rabbits.—

1. Pare and clean the wound, and cover it thickly with fresh cow-dung, or soft clay, and bind it up thoroughly with a cloth. Grafting wax bound on is also good. Complete girdling, when done late in spring—when settled weather is approaching—can be remedied in this manner.

2. Insert long scions over the wound, by paring them thin on both ends and placing one end under the bark on the upper edge of the wound and the other under the bark on the lower edge. Wax thoroughly the points of union, and tie a cloth band about the trees over both extremities of the scions.

To drive rabbits from orchards.—Dip rags in melted sulphur and then secure them to sticks which are stuck promiscuously through the orchard.

It should be an imperative rule with all orchardists not to allow brush heaps or piles of poles and rails to remain upon their premises if rabbits are troublesome in the neighborhood, for it is in such places that the animals live.

Wash to protect trees from rabbits.—Fresh cow-dung, 1 peck, quick-lime, ½ peck, flowers of sulphur, ½ pound; lamp-black, ¼ pound. Mix the whole into a thick paint with urine and soap suds.

California rabbit wash.—Commercial aloes, one pound to four gallons of water, both sprinkled on leaves and painted on the bark, gives a bitter taste, which repels rabbits.

California rabbit poisons.—

1. Pieces of water-melon, canteloupe, or other vegetables of which they are fond, may be poisoned with strychnine and then scattered around the orchard.

2. To 100 pounds of wheat take 9 gallons of water and 1 pound of phosphorus, 1 pound of sugar, and 1 ounce oil of rhodium. Heat the water to boiling point and let it stand all night. Next morning stir in flour sufficient to make a sort of paste. Scatter it about the place.

3. Another preparation is ½ teaspoonful of powdered strychnine, 2 teaspoonfuls of fine salt, and 4 of granulated sugar. Put all in a tin box and shake well. Pour in small heaps on a board. It hardens into a solid mass. Rabbits lick it for the salt and the sugar disguises the poison.

Sulphur for rabbits.—Equal proportions of sulphur, soot and lime, made into a thick cream with cow manure. Smear upon the trees.

Cow-manure for rabbits.—A mixture of lime, water and cow-manure, made strong, forms an excellent anti-rabbit composition.

Asafœtida for rabbits.—A teaspoonful of tincture of asafœtida in ½ bucketful of liquid clay, mud, or muck of any kind. Apply with a brush to the stem and branches of young trees. Two or three applications during winter.

California ground squirrel remedies.—Take 5 quarts clean wheat, scald with water, drain. Take ⅔ cup of white sugar, dissolve with sufficient water to make a syrup; add 1 ounce powdered strychnine, stir thoroughly until a thin paste is formed. Pour this on the damp wheat. Stir thoroughly for at least 15 minutes. Add 1 pint powdered sugar, stir; add 5 to 10 drops of rhodium and 5 to 10 drops of oil of anise seed. Place a few grains in each squirrel hole, putting it as far in as possible.

Bisulphide of carbon is also largely used. A small quantity is poured into the barrow, and the hole is immediately closed securely with dirt.

Tying newspapers about trees in such manner as to allow the upper part of the paper to project loosely a few inches, frightens the squirrels away.

Poison for English sparrows.—Dissolve arseniate of soda in warm water at the rate of 1 ounce to 1 pint; pour this upon as much wheat as it will cover (in a vessel which can be closed so as to prevent evaporation), and allow it to soak for at least 24 hours. Dry the wheat so prepared, and it is ready for use. It should be distributed in winter in places where the sparrows congregate.

Bird poisons.—

1. Place a shallow box on the end of a pole and put it 4 or 5 feet from the ground to keep the poison out of the way of domestic fowls. In the box sprinkle corn meal and a very little strychnine, which mixture the birds eat and are very soon killed. It will not hurt dogs or cats to eat the dead birds, for the reason that there is not enough poison absorbed by the bird. (Californian.)

Bird poisons, continued

2. Put the strychnine in pieces of apples and stick them on the ends of limbs of the trees. (Californian.)

3. To protect newly-planted seeds. Coat the seeds with red lead, by moistening the seeds slightly and stirring in red lead until all the seeds are thoroughly coated. Let the seeds dry for two or three hours before sowing.

To protect fruits from birds, one of the best devices is mosquito bar spread over the bushes or trees. For bush fruits and small trees the expense is not great.

CHAPTER VI.

WEEDS.

1. **Weeds in general.**—Weeds rarely trouble the good cultivator, particularly in vegetable gardening. Intensive methods of culture allow no weeds to appear. It is economy, both in labor and in returns from the crop, to prevent weeds from appearing, rather than to hoe or pull them out after they are partly grown and have done some damage. Frequent light stirring of the soil with cultivator, harrow or rake is the cheapest mode of weed destruction. In the struggle with weeds it is well to consider the longevity of the various species. Annual weeds, those which naturally die after the season's growth, require no special treatment. Biennial species, those which die at the end of the second year, may be held in check by preventing them from seeding, as by mowing them when coming into flower. Examples of this class are the mullein, wild carrot and field or bull thistle Perennial species, those which live indefinitely, often require particular treatment. Some of the worst of the perennial species are Canada thistle, white or ox-eye daisy, toad-flax, live-forever, docks, and various grasses. Very frequent, persistent and thorough cultivation will destroy any of these. Cultivation should be repeated even before the weeds recover sufficiently to take root again. Seeding down and mowing the weeds with the hay will destroy most weeds. In dry and sandy soils three or four thorough plowings during the season will destroy Canada

Weeds in general, continued.

thistles and other pests, particularly in dry years, but on richer and retentive soils more thoroughness must be practiced

2. **Weeds in Lawns.**—Weeds usually come up thickly in newly sown lawns They are to be prevented by the use of commercial fertilizers or very clean manure and clean grass seed. Clean june-grass, or blue-grass, seed is usually best. Grass seed should be shown very thickly—2 to 4 bu. to the acre—and annual weeds cannot persist long. Frequent mowings during summer will keep the weeds down, and most species will not survive the winter. In old lawns most perennial weeds can be kept down by very frequent mowings with a good lawn mower Grass can stand more cutting than weeds If mowing cannot be practiced often enough for this purpose, the weeds may be cut off below the surface with a long knife or spud, and the crowns are then readily pulled out Or a little sulphuric acid—oil of vitriol—may be poured upon the crown of each plant

3. **Weeds on Walks.**—Walks should be so made that weeds cannot grow in them This can be done by making a deep stone foundation and filling between the stones with cinders, coal ashes, or other similar material But when weeds become established they can be destroyed by the following methods

SALT.—Hot brine (1 lb. of salt to 1 gal of water), boiled in a kettle on wheels and dipped out into watering pots. Brine is better than dry salt, because it leaves very little color upon the walk.

LIME AND SULPHUR.—10 gals. of water, 20 lb. of quicklime and 2 lb flowers of sulphur are boiled in an iron vessel, after settling, the clear part is dipped off and used when needed. Care must be taken, as it will destroy edgings

Weeds on Walks, continued.

OIL OF VITRIOL.—1 part oil of vitriol (sulphuric acid) to 30 parts of water Apply with a watering-pot Choose a clear evening after a hot day. Keep clear of the edgings. The pot should be well painted, or a wooden pail should be used.

ARSENITE OF SODA.—Place 1 lb of powdered arsenic in 3 gals. of cold water. boil and keep stirring: then add 7 gals. of cold water and 2 lbs. of crushed soda; stir well while boiling. Apply in dry weather.

CARBOLIC ACID.—1 oz of carbolic acid to 1 gal of water sprinkled over the path from a common watering-pot Will also destroy ants.

COAL-TAR COATING—Mix coal-tar with gravel to the consistency of mortar; spread over the path 1 to 2 in. thick; cover this with gravel, then roll and add another thin coating of gravel to finish

4. **Moss on Walks and Lawns.**—In damp and shady places, and also in sterile places, moss may appear on walks and lawns. If the conditions cannot be improved, the following treatments may be tried:

1 lb. oil of vitriol (sulphuric acid) to 10 qts. of water. Wet the surface thoroughly, being careful not to sprinkle edgings or good sod.

In early spring, while the ground is soft, with a long toothed rake, work it backwards and forwards, in order to bring the moss to the surface. Clear away the moss and leave the ground untouched for a fortnight. Early in March repeat the operation, and about the middle of that month apply a dressing of rich compost, which may consist of any old rubbish well decomposed, adding ⅙ of fresh lime. Mix with compost a few days before using. Cover the ground with the compost at the rate of 200 barrow-loads per acre, passing it through a ¾-in. sieve, to save the trouble of rolling Rake it evenly over the suface with a wooden rake, and when dry seed down. An English method.

CHAPTER VII.

Waxes for Grafting and for Wounds.

I. Common Resin and Beeswax Waxes.—

1. Reliable Wax.—Resin, 4 parts by weight · beeswax, 2 parts; tallow. 1 part. Melt together and pour into a pail of cold water. Then grease the hands and pull the wax until it is nearly white.

2. Resin, 4 lbs.; beeswax, 1 lb.· tallow, 1 lb.

3. Resin, 6 lbs., beeswax, 2 lbs.; linseed oil, 1 pt.

4. 6 lbs. resin, 1 lb. beeswax and 1 pt. linseed oil; apply hot with a brush, one-eighth of an inch thick over all the joints.

5. For Warm Weather.—Four lbs. of resin, 1 lb. of beeswax, and from half to a pint of raw linseed oil; melt all together gradually, and turn into water and pull. The linseed oil should be entirely free from cotton-seed oil.

6. Resin, 6 parts; beeswax, 1 part, tallow. 1 part. To be used warm, in the house.

7. Resin, 4 or 5 parts; beeswax, 1½ to 2 parts; linseed oil, 1 to 1½ parts. For out-door work.

2. Alcoholic Waxes.—

8. Lefort's Liquid Grafting Wax, or Alcoholic Plastic.—Best white resin, 1 lb.; beef tallow. 1 oz.; remove from the fire and add 8 ozs. of alcohol. Keep in closed bottles or cans.

9. Alcoholic Plastic with Beeswax.—Melt 6 parts white resin with 1 part beeswax; remove from stove and partially cool by stirring, then add gradually—with

Alcoholic Waxes (Alcoholic Plastic with Beeswax), continued.

continued stirring—enough alcohol to make the mixture, when cool, of the consistency of porridge. In the temperature of the grafting-room it will remain sufficiently plastic to permit applying to the cut surfaces with the finger.

10. ALCOHOLIC PLASTIC WITH TURPENTINE.—Best white resin, 1 lb.; beef tallow, 1 oz.; turpentine, 1 teaspoonful; add enough alcohol (13 to 15 fluid ozs. of 95 per cent. alcohol) to make the wax of the consistency of honey. Or, less alcohol may be added if the wax is to be used with the fingers.

3. **French and Pitch Waxes.—**

11. COMMON FRENCH.—Pitch, ½ lb.; beeswax, ½ lb.; cow-dung, 1 lb. Boil together, melt and apply with a brush.

12. COMMON FRENCH BANDAGE WAX.—Equal parts of beeswax, turpentine and resin. While warm spread on strips of coarse cotton or strong paper.

13. GRAFTING CLAY.—⅓ cow-dung, free from straw, and ⅔ clay, or clayey loam, with a little hair, like that used in plaster, to prevent its cracking. Beat and temper it for two or three days until it is thoroughly incorporated. When used it should be of such a consistency as to be easily put on and shaped with the hands.

14. 2 lbs. 12 ozs. of resin and 1 lb. 11 ozs. of Burgundy pitch. At the same time, melt 9 ozs. of tallow; pour the latter into the former, while both are hot, and stir the mixture thoroughly. Then add 18 ozs. of red ochre, dropping it in gradually and stirring the mixture at the same time.

15. Black pitch, 28 parts; Burgundy pitch, 28 parts; beeswax, 16 parts; grease, 14 parts; yellow ochre, 14 parts.

16. Black pitch, 28 lbs.; Burgundy pitch, 28 lbs.; yellow wax, 16 lbs.; suet or tallow, 14 lbs.; sifted ashes, 14

French and Pitch Waxes, continued.

lbs. When used, warm sufficiently to make it liquid, without being so hot as to injure the texture of the branches.

17. Melt together 1¼ lb. of clear resin and ¾ lb. of white pitch. At the same time melt ¼ lb. of tallow. Pour the melted tallow into the first mixture, and stir vigorously. Then before the stuff cools add, slowly stirring meantime, ½ lb. of Venetian red. This may be used warm or cold.

4 **Waxed String and Bandage.—**

18. WAXED STRING FOR ROOT-GRAFTING.—Into a kettle of melted wax place balls of No. 18 knitting cotton. Turn the balls frequently, and in five minutes they will be thoroughly saturated, when they are dried and put away for future use. This material is strong enough, and at the same time breaks so easily as not to injure the hands. Any of the resin and beeswax waxes may be used. When the string is used, it should be warm enough to stick without tying.

19. WAXED CLOTH.—Old calico or thin muslin is rolled on a stick and placed in melted wax. When saturated it is allowed to cool by being unrolled on a bench. It is then cut in strips to suit.

5. **Waxes for Wounds.—**

20, Any of the more adhesive grafting waxes are excellent for dressing wounds, although most of them cleave off after the first year. Stiff and ochreous paints are also good.

21. COAL-TAR.—Apply a coating of coal-tar to the wound, which has first been pared and smoothed. If the wound contains a hole, plug it with seasoned wood.

22. HOSKINS' WAX.—Boil pine tar slowly for three or four hours; add ½ lb. of beeswax to a quart of the tar. Have ready some dry and finely sifted clay, and when the mixture of tar and wax is partially cold, stir into the

Waxes for Wounds (Hoskins' Wax), continued.

above named quantity about 12 ozs. of the clay; continue the stirring until the mixture is so stiff, and so nearly cool, that the clay will not settle. This is soft enough in mild weather to be easily applied with a knife or spatula.

23. SCHÆFELL'S HEALING PAINT.—Boil linseed oil (free from cotton-seed oil) one hour, with an oz. of litharge to each pt. of oil; then stir in sifted wood ashes until the paint is of the proper consistency. Pare the bark until smooth, as the fuzzy edge left by the saw will cause it to die back. Paint the wound over in dry weather, and if the wound is very large, cover with a gunny-sack.

24. TAR FOR BLEEDING IN VINES.—Add to tar about 3 or 4 times its weight of powdered slate or some similar substance. Apply with an old knife or flat stick.

25. HOT IRON FOR BLEEDING IN VINES.—Apply a hot iron to the bare surface until it is charred, and then rub into the charred surface a paste made of newly-burnt lime and grease.

26. COLLODION FOR BLEEDING IN VINES.—It may be applied with a feather or small brush. In some extreme cases 2 or 3 coats will be needed, in which case allow the collodion to form a film before applying another coat. Pharmaceutical collodion is better than photographic.

CHAPTER VIII.

Cements, Mortars, Paints and Glues.

1 **Cement and Mortar.—**

Cements for Iron.—1. Sal ammoniac, 2 ozs.; sulphur, 1 oz.; clean iron borings or filings reduced to powder, 12 lbs.; water enough to form a thin paste.

2. Sal ammoniac, 2 ozs.; iron filings, 8 lbs.; sufficient water.

3. 1 or 2 parts of sal ammoniac to 100 of iron filings. When the work is required to set quickly, increase the sal ammoniac slightly and add a small amount of sulphur.

4. Iron filings, 4 lbs.; pipe clay, 2 lbs.; powdered potsherds, 11 lbs.; make into a paste with moderately strong brine.

5. Equal parts of red and white lead, mixed into a paste with boiled linseed oil. Used for making metallic joints of all kinds.

6. To 4 or 5 parts of clay, thoroughly dried and pulverized, add 2 parts of iron filings free from oxide, 1 part of peroxide of manganese, ½ of sea salt and ½ of borax mix well and reduce to a thick paste with water. Use immediately. Expose to warmth, gradually increasing almost to white heat.

7. Sifted coal ashes 2 parts and common salt 1 part. Add water enough to make a paste and apply at once. This is also good for stoves and boilers, as it stands heat.

Boiler Cements.—1. Chalk, 60 parts; lime and salt, of each, 20 parts; sharp sand, 10 parts; blue or red clay

Cement and Mortar (Boiler Coments), continued.

and clean iron filings, of each, 5 parts. Grind together, and calcine or heat.

2. Powdered clay, 6 lbs.; iron filings, 1 lb. Make into a paste with linseed oil.

3. Powdered litharge, 2 parts; silver sand and slaked lime, of each, 1 part; boiled oil enough to form a paste.

These cements are used for stopping leaks and cracks in boilers, iron pipes, stoves, etc. They should be applied as soon as they made.

TAR CEMENT.—Coal tar, 1 part; powdered slate (slate flour), 3 or 4 parts; mix by stirring, until thoroughly incorporated. Very useful for mending watering pots, barrels, leaky sash, etc. It remains somewhat elastic. It does not adhere to greasy surfaces. It will keep for a long time before using.

COPPER CEMENT.—Beef blood thickened with sufficient finely powdered quick-lime to make it into a paste is used to secure the edges and rivets of copper boilers, kettles, etc. Use immediately.

FIREPROOF or STONE CEMENT.—Fine river sand, 20 parts; litharge, 2 parts; quicklime, 1 part; linseed oil, enough to form a thick paste. Used for walls and broken stonework.

EARTHENWARE CEMENT.—Grated cheese, 2 parts; powdered quicklime, 1 part; fresh white of egg, enough to form a paste. Use as soon as possible.

For fine earthenware, liquid glue may be used.

CEMENT FOR GLASS.—Methylated spirit sufficient to render liquid a half dozen pieces of gum mastic the size of a large pea; in another bottle dissolve the same quantity of isinglass, which has been soaked in water and allowed to get surface dry, in 2 oz. of methylated spirits; when the first is dissolved add 2 pieces of either gum galbanum or gum ammoniac; apply gentle heat and stir; add the solution of isinglass, heat again and stir. Keep in a tightly-stoppered bottle, and when used set in boiling water.

Cement and Mortar, continued.

SEALING CEMENTS.—Beeswax, 1 lb.; resin, 5 lbs. Stir in sufficient red ochre and Brunswick green, or lamp black, to give the desired color.

2. Black pitch, 6 lbs ; ivory black and whiting, of each. 1 lb. Less attractive than the former.

These are used for sealing up bottles, barrels, etc.

MORTAR FOR HEAVY RUBBLE WORK or BRICK WORK.—1 part of slaked lime, 2 parts of sand and ⅓ part of blacksmith's ashes; for brick work 1 part of lime, 1 of sand and 1 of blacksmith's ashes.

2. Concrete, etc., for Floors, Borders and Walks.—

GROUT FLOOR.—1. To secure a good grout or cement floor, make a good foundation of small stones or brick-bats, and cover three or four inches thick with a thin mortar, made of 2 parts sharp sand and 1 part water lime.

2. Fresh powdered lime, 2 parts; Portland cement, 1 part; gravel, broken stone, or brick, 6 parts. Mix with water to a liquid consistency, and let it be thrown forcibly, or dropped, into its position. It should be well beaten or rammed to render it solid.

3. Equal parts of gravel, well screened, and clean river or pit sand. With 5 parts of the sand and gravel, mix 1 part of Portland cement. Mix with water, and apply 1 in. thick.

FOR GARDEN BORDERS.—Nine parts gravel and 1 part unslaked lime ; slake the lime and cover it with the gravel, then add water sufficient to make a very thin mortar. Apply 3 in. deep ; allow it to stiffen a little, then roll. Finish with an inch thick of 1 part lime and 3 parts gravel. Apply soft.

FOR WALKS.—Walks should always have a well-made foundation of stones or brick-bats to give hardness and insure drainage. The top of the walk may be made of gravel, sifted coal ashes, cinders from foundries, furnaces, etc. If gravel is used, care should be exercised to

Concrete, etc. (for Walks), continued.

avoid the round or washed gravel, particularly that lying in the beds of streams, for it will not pack. One part of clean clay to 4 or 5 of gravel makes a good walk. Or the following may be used:

1. One part mineral pitch, 1 part resin, 7 parts chalk and 2 parts coarse sand. Boil together, and lay it while in a hot state, adding a little gravel.

2. Boil for a short time 18 parts of mineral pitch and 18 parts of resin in an iron kettle; then add 60 parts of coarse sand; mix well, and lay it on the path to the thickness of 1 in.; then sift a little fine gravel over it, and beat it down before the cement sets.

3. Put down a coat of tar and sift some road sand or coal ashes over it very thickly. When this is dry repeat the operation until you have 4 coats of tar and as many of coal ashes or road sand.

4. Two parts of thoroughly dried sand, 1 part cinders, thoroughly dried. Mix together; then spread the sand and cinders on the ground and make a hole in the center, into which pour boiling hot tar and mix to a stiff paste; then spread on the walk, beat and roll.

5. Two parts lime rubbish and 1 part coal ashes, both very dry and finely sifted; in the middle of the heap make a hole; into this pour boiling hot coal tar; mix to a stiff mortar and spread on the ground 2 or 3 in. thick. The ground should be dry and beaten well. Cover with coarse sand; when cold, roll well.

3. Paints and Protective Compounds.—

Home-made Washes for Fences and Out-buildings may be made by various combinations of lime and grease. The following are good formulas:

1. Slake fresh quick-lime in water, and thin it to a paste or paint with skim-milk. The addition of 2 or 3 handfuls of salt to a pail of the wash is beneficial.

2. 2 qts. skim-milk, 8 ozs. of fresh slaked lime, 6 ozs. of boiled linseed oil and 2 oz. of white pitch, dissolved in

Paint and Protective Compounds, continued.

the oil by a gentle heat. The lime must be slaked in cold water and dried in the air until it falls into a fine powder; then mix with ¼ part of the milk, adding the mixed oil and pitch by degrees; add the remainder of the milk. Lastly, add 3 lbs. of the best whiting and mix the whole thoroughly.

3. Slake ½ bu. of lime in boiling water, keeping it covered; strain and add brine made by dissolving 1 pk. of salt in warm water, and 3 lbs. rice flour, then boil to a paste; add ½ lb. whiting and 1 lb. of glue dissolved in warm water. Mix and let stand for a few days before using.

FIRE-PROOF PAINT.—In a covered vessel slake the best quick-lime, then add a mixture of skim-milk and water, and mix to the consistency of cream; then add 20 lbs. of alum, 15 lbs. of potash and 1 bu. of salt to every 100 gals. of the liquid. If white paint is desired, add to the above 6 lbs. of plaster of Paris.

FOR DAMP WALLS.—1. ¾ lb. of hard soap to 1 gal. of water. Lay over the bricks steadily and carefully with a flat brush, so as not to form a froth or lather on the surface. After 24 hrs., mix ½ lb. of alum with 4 gals. of water; let it stand 24 hours, and then apply it in the same manner over the coating of soap. Apply in dry weather.

2. 1½ lb. resin, 1 lb. tallow, 1 qt. linseed oil. Melt together and apply hot; two coats.

PAINT FOR GREENHOUSE ROOFS.—Make a paint of ordinary consistency of white lead and naphtha. It is removed from the glass by the use of a scrubbing brush. Make it thin or it is hard to remove.

Ordinary lime whitewash is good for temporary use.

WATER-PROOFING PAINTS.—For leather.—1. ½ lb. of shellac, broken into small pieces in a quart bottle; cover with methylated spirit, cork it tight, put it on a shelf in a warm place, and shake it well several times a day;

Paints and Protective Compounds, continued.

then add a piece of camphor as large as a hen's egg; shake again and add 1 oz. of lamp black. Apply with a small paint brush.

2. Put into an earthern jar ¼ lb. of beeswax, ½ pt. of neatsfoot oil, 3 or 4 tablespoonfuls of lamp black, and a piece of camphor as large as a hen's egg. Melt over a slow fire. Have both grease and leather warm and apply with a brush.

3. 1 pt. of linseed oil, ½ lb. mutton suet, 6 oz. of clean beeswax and 4 ozs. of resin; melt and mix well. Use while warm with a brush on new boots or shoes.

For Cloth for Pits and Frames.—Old pale linseed oil, 3 pints; sugar of lead (acetate of lead), 1 oz.; white resin, 4 ozs. Grind the acetate with a little of the oil, then add the rest and the resin. Use an iron kettle over a gentle fire. Apply with a brush, hot.

For Paper.—Dissolve 1¾ lb. of white soap in 1 qt. of water; in another qt. of water dissolve 1½ oz. of gum arabic and 5 ozs. of glue. Mix the two liquids, warm them and soak the paper in it and pass through rollers, or simply hang it up to dry.

To Prevent Metals from Rusting.—Melt together 3 parts of lard and 1 part of powdered resin. A very thin coating applied with a brush will keep stoves and grates from rusting during summer, even in damp situations. A little black lead can be mixed with the lard. Does well on nearly all metals.

To Prevent Rusting of Nails, Hinges, Etc.—1 pt. of linseed oil, 2 ozs. black lead; mix together. Heat nails red-hot and dip them in.

4. Glues.—

Liquid Glue.—1. Dissolve 2 lbs. of best pale glue in 1 qt. of water in a covered vessel, placed in a hot water bath; when cold, add to it 7 ozs. of commercial nitric acid. When cold put in bottles.

Glues (Liquid Glue), continued.

2. Finest pale orange shellac, broken small, 4 ozs.; methylated spirit, 3 oz.; put in a warm place in a closely corked bottle until dissolved. Should have the consistency of molasses. Or, borax, 1 oz.; water, ¾ pt.; shellac as before; boil in a closely covered vessel until dissolved; then evaporate until nearly as thick as molasses.

Flower Gum.—Very fine white shellac mixed with methylated spirit in a stone jar; shake well for ½ an hour and place by a fire, and shake it frequently the first day. Keep in a cool place. Leave the camel's-hair brush in the gum. Never fill the brush too full and gum the petals close to the tube.

Gum for Labels and Specimens.—1. Two parts of gum arabic, 1 part of brown sugar; dissolve in water to the consistency of cream.

2. Five parts of best glue soaked in 18 to 20 parts of water for a day, and to the liquid add 9 parts of sugar candy and 3 parts of gum arabic.

3. Good flour and glue, to which add linseed oil, varnish and turpentine, ½ oz. each to the lb. Good when labels are liable to get damp.

CHAPTER IX.

Seed Tables.

1. Quantity of Seed required to Sow an Acre.

Asparagus.....4 or 5 lbs., or 1 oz. for 50 ft. of drill.
Beans, Dwarf.....in drills.....1½ bu.
" Pole..... " .....10 to 12 qts.
Beet..... " .....5 to 6 lbs.
Buckwheat..... " .....1 bu.
Cabbage.....in beds to transplant.....¼ lb.
Carrot.....in drills.....3 to 4 lbs.
Cauliflower.....1 oz. of seed for 1,000 plants..
Celery.....1 oz. for 2,000 plants.....
Corn.....in hills.....8 to 10 qts.
Cucumber..... " .....2 lbs.
Cress, Water.....in drills.....2 to 3 lbs.
" Upland.... " .....2 to 3 lbs.
Egg-plant.....1 oz. of seed for 1,000 plants..
Kale, or Sprouts.....3 to 4 lbs.
Lettuce.....1 oz. of seed for 1,000 plants..
Melon, Musk.....in hills.....2 to 3 lbs.
" Water..... " .....4 to 5 lbs.
Mustard.....broadcast.....½ bu.
Onion.....in drills.....5 to 6 lbs.
" for Sets..... " .....30 lbs.
" Sets..... " .....6 to 12 bu.
Parsnip..... " .....4 to 6 lbs.
Peas..... " .....1 to 2 bu.
Potato (cut tubers).....7 bu.

Quantity of Seed required to Sow an Acre, continued.

Pumpkin	in hills	4 to 5 lbs.
Radish	in drills	8 to 10 lbs
Sage	"	8 to 10 lbs
Salsify	"	8 to 10 lbs.
Spinach	"	10 to 12 lbs.
Squash, Bush	in hills	4 to 6 lbs.
" Running	"	3 to 4 lbs.
Tomato	to transplant	¼ lb.
Turnip	in drills	1 to 2 lbs.
"	broadcast	3 to 4 lbs.
Grass (mixed lawn)		2 to 4 bu.

2. Weight and Size of Garden Seeds.

Adapted from Vilmorin's tables.

A litre is about 1⅘ pints, and a gramme is 15⅔ grains.

	Weight of a litre of seeds in grammes.	*Number of seeds in 1 gramme.*
Angelica	150	170
Anise	300	200
Asparagus Bean (*Dolichos sesquipedalis, L.*)	770	500 to 650
Balm	550	2,000
Basil	530	800
Bean	625 to 850	75 to 800 in 100 g.
Beet	250	50
Bolage	480	65
Borecole	700	300
Broccoli	700	375
Cabbage	700	300
Caper	460	160
Caraway	420	350
Cardoon	630	25
Carrot with the spines	240	700
" without the spines	360	950
Catmint	780	1,200

Weight and Size of Garden Seeds, continued.

	Weight of a litre of seeds in grammes.	*Number of seeds in 1 gramme.*
Cauliflower	700	375
Celery	480	2,500
Chervil	380	450
" Sweet-scented	250	40
" Turnip-rooted	540	450
Chicory	400	700
Chick-pea	780	30 in 10 g.
Coriander	320	90
Corn-salad	280	1,000
Cress, American	540	950
" Common Garden	730	450
" Meadow (Cuckoo-flower)	580	1,500
" Para	200	3,400
" Water	580	4,000
Cucumber, Common	500	33
" Globe	500	100
" Prickly-fruited Gherkin	550	130
" Snake (*Cucumis flexuosus*)	450	40
Dandelion	270	1,200 to 1,500
Dill	300	900
Egg-plant	500	250
Endive	340	600
Fennel, Common or Wild	450	310
" Sweet	235	125
Gombo, see Okra.		
Good King Henry	625	430
Gourds, Fancy	450	20
Hop	250	200
Horehound	680	1,000
Hyssop	575	850
Kohl-rabi	700	300
Leek	550	400

Weight and Size of Garden Seeds, continued.

	Weight of a litre of seeds in grammes.	*Number of seeds in 1 gramme.*
Lettuce	430	800
Lovage	200	300
Maize, or Indian Corn	640	4 or 5
Marjoram, Sweet	550	4,000
" Winter	675	12,000
Martynia	290	20
Musk-melon	360	55
Mustard, Black or Brown	675	700
" Chinese Cabbage-leaved	660	650
" White, or Salad	750	200
Nasturtium, Tall	340	7 to 8
" Dwarf	600	15
Okra	620	15 to 18
Onion	500	250
Orach	140	250
Pea	700 to 800	20 to 55 in 10 g.
" Gray or Field	680 to 800	50 to 80 in 10 g.
Peanut	400	2 or 3
Pepper	450	150
Pumpkin	250	3
Purslane	610	2,500
Radish	700	120
Rampion	800	25,000
Rhubarb	80 to 120	50
Rocket Salad	750	550
Rosemary	400	900
Rue	580	500
Sage	550	250
Salsify	230	100
Savory, Summer	500	1,500
" Winter	430	2,500
Scorzonera	260	90
Scurvy-grass	600	1,500 to 1,800
Sea-kale	210	15 to 18

Weight and Size of Garden Seeds, continued.

	Weight of a litre of seeds in grammes.	*Number of seeds in 1 gramme.*
Spinach, Prickly-seeded	375	90
" Round-seeded	510	110
" New Zealand	225	10 to 12
Squash, Bush-scallop	430	10
Strawberry	600	800 to 2,500
" Blite (*Blitum*)	800	5,000
" Tomato (*Physalis*)	650	1,000
Sweet Cicely	250	40
Tansy	300	7,000
Thyme	680	6,000
Tomato	300	300 to 400
Turnip	670	450
Valerian, African	110	250
Watermelon	460	5 or 6
Wax Gourd	300	21
Welsh Onion, Common	480	300
" Early White	590	500
Wormwood	650	11,500

3. Number of Tree Seeds in a Pound.

FRUIT TREES.

	About
Apple	12,000
Cherry Pits	1,000
Peach	200
Pear	15,000
Plum	600
Quince	15,000
Mulberry	200,000

FOREST TREES.

		By count.
Butternut	Juglans cinerea	15
Black Walnut	Juglans nigra	25
American Horse Chestnut	Æsculus glabra	36
Hickory (Shell Bark)	Carya alba	78

Number of Tree Seeds in a Pound (Forest Trees), continued.

		By count.
American Sweet Chestnut	*Castanea vesca*	90
Silver-Leaved Maple	*Acer dascycarpum*	2,421
Honey Locust	*Gleditschia triacanthos*	2,496
Black Cherry	*Prunus serotina*	4,311
Black Ash	*Fraxinus sambucifolia*	5,629
American Basswood	*Tilia Americana*	6,337
Norway Maple	*Acer platanoides*	7,231
Sugar Maple	*Acer saccharinum*	7,488
Berberry	*Berberis vulgaris*	8,183
Red Cedar	*Juniperus Virginiana*	8,321
Rock Elm	*Ulmus racemosa*	8,352
American White Ash	*Fraxinus Americana*	9,858
Osage Orange	*Maclura aurantiaca*	10,656
Silver Fir	*Abies pectinata*	12,000
Box Elder	*Acer Negundo*	14,784
Hardy Catalpa	*Catalpa speciosa*	19,776
Ailantus	*Ailantus glandulosa*	20,161
White Pine	*Pinus Strobus*	20,540
Scarlet Maple	*Acer rubrum*	22,464
Green Ash	*Fraxinus viridis*	22,656
Black Locust	*Robinia pseudacacia*	28,992
Red Elm	*Ulmus fulva*	54,359
American White Elm	*Ulmus Americana*	92,352
American Mountain Ash	*Pyrus Americana*	108,327
White Birch	*Betula alba*	500,000

4. Longevity of Garden Seeds.

Adapted from Vilmorin's tables.

The number denotes that the seeds had not all lost their germinating power at the termination of the number of years recorded.

	Average *Years.*	Extreme *Years.*
Angelica	1 or 2	3
Anise	3	5
Asparagus Bean (*Dolichos sesquipedalis*, L.)	3	8

Longevity of Garden Seeds, continued.

	Average *years.*	Extreme *years.*
Balm	4	7
Basil	8	10+
Bean	3	8
Beet	6	10+
Borage	8	10+
Borecole	5	10
Broccoli	5	10
Cabbage	5	10
Caraway	3	4
Cardoon	7	9
Carrot, with the spines	4 or 5	10+
" without the spines	4 or 5	10+
Catmint	6	10+
Cauliflower	5	10
Celery	8	10
Chervil	2 or 3	6
" Sweet-scented	1	1
" Turnip-rooted	1	1
Chicory	8	10+
Chick-pea	3	8
Coriander	6	8
Corn-salad, Common	5	10
Cress, American	3	5
" Common Garden	5	9
" Meadow (or Cuckoo-flower)	4	(?)
" Para	5	7+
" Water	5	9
Cucumber, Common	10	10+
" Globe	6	(?)
" Prickly-fruited Gherkin	6	7+
" Snake (*Cucumis flexuosus*)	7 or 8	10+
Dandelion	2	5
Dill	3	5
Egg-plant	6	10
Endive	10	10+

Longevity of Garden Seeds, continued.

	Average *years.*	Extreme *years.*
Fennel, Common or Wild	4	7
" Sweet	4	7
Gombo, see Okra.		
Good King Henry	3	5
Gourds, Fancy	6	10+
Hop	2	4
Horehound	3	6
Hyssop	3	5
Kohl-rabi	5	10
Leek	3	9
Lettuce, Common	5	9
Lovage	3	4
Maize, or Indian Corn	2	4
Marjoram, Sweet	3	7
" Winter	5	7
Martynia	1 or 2	(?)
Musk-Melon	5	10+
Mustard, Black or Brown	4	9
" Chinese Cabbage-leaved	4	8
" White or Salad	4	10
Nasturtium, Tall	5	5
" Dwarf	5	8
Okra	5	10+
Onion	2	7
Orach	6	7
Parsnip	2	4
Parsley	3	9
Pea, Garden	3	8
" Gray or Field	3	8
Pepper	4	7
Pumpkin	4 or 5	9
Purslane	7	10
Radish	5	10+
Rampion	5	10+
Rhubarb	3	8

Longevity of Garden Seeds, continued.

	Average *years.*	Extreme *years.*
Rocket Salad	4	9
Rosemary	4	(?)
Rue	2	5
Sage	3	7
Salsify	2	8
Savory, Summer	3	7
" Winter	3	6
Scorzonera	2	7
Scurvy-grass	4	7
Sea-kale	1	7
Spinach, Prickly-seeded	5	7
" Round-seeded	5	7
" New Zealand	5	8
Squash, Bush-scallop	6	10+
Strawberry	3	6
" Tomato (*Physalis*)	8	10+
Sweet Cicely	1	1
Tansy	2	4
Thyme	3	7
Tomato	4	9
Turnip	5	10+
Valerian, African	4	7
Watermelon	6	10
Wax Gourd	10	10+
Welsh Onion, Common	2 or 3	7
" Early White	3	8
Wormwood	4	6

5. Average Time required for Garden Seeds to Germinate.

Bean	6–10 days.	Celery	10–20 "
Beet	7–10 "	Corn	5– 8 "
Cabbage	6–10 "	Cucumber	6–10 "
Carrot	12–18 "	Endive	5–10 "
Cauliflower	6–10 "	Lettuce	6– 8 days.

Average Time required for Garden Seeds to Germinate, continued.

Onion	7–10 days.	Radish	3– 6 days
Pea	6–10 "	Salsify	7–12 "
Parsnip	10–20 "	Tomato	6–12 "
Pepper	9–13 "	Turnip	4– 8 "

6. Proper Kinds and Quantities of Seeds for a Model English Kitchen-garden of 1 1-4 Acres (London).

Peas, 30 qts.; white cabbage of different kinds, 6 ozs.; Savoy cabbage, 1½ ozs.; Brussels sprouts, 2 ozs.; cauliflower, 3 ozs.; broccoli, 7 ozs.; borecole, 2 ozs.; red cabbage, 1 oz.; kohl-rabi, 1 oz.; white turnip, 8 ozs.; yellow turnip, 2 ozs.; early potatoes, 1 bu.; carrots, 7 ozs.; onions, 8 ozs.; broad beans, 6 qts.; narrow beans, 3 qts.; kidney beans, 3 qts.; scarlet runner beans, 2 qts.; celery, 3 ozs. Flanders spinach, 1 qt.; summer spinach, 2 qts.; Jerusalem artichoke, 1 pk.; red beet, 4 ozs.; parsnips, 4 ozs.; leeks, 2 ozs.; garlic, ½ lb.; shallots, 3 lbs.; salsify, ½ oz.; scorzonera, ½ oz.; Cos lettuce, 5 ozs.; cabbage lettuce, 3 ozs.; endive, 2 ozs.; radish, 3 pts.; cress, 1 pt.; mustard, 1 qt.; parsley, 2 ozs.

CHAPTER X.

Planting Tables.

1. Dates for Sowing or Setting Kitchen Garden Vegetables in Different Latitudes.

Lansing, Michigan.

(*Average of 4 and 5 years.*)

Bean, Bush	May 16.
Bean, Pole	May 30.
Beet	April 20.
Broccoli	May 10.
Brussels Sprouts	May 10.
Cabbage, early, under glass	March 15.
Cabbage, late	May 20.
Carrot	May 7.
Cauliflower, under glass	March 15.
Celery, under glass	March 18.
" in open ground	May 20.
Corn	May 19.
Cucumber	May 23.
Egg-Plant, under glass	March 15.
Kale	May 9.
Kohl-rabi	May 9.
Lettuce	May 5.
Melon	May 30.
Okra	May 15.
Onion	April 17.
Parsnips	May 7.
Pepper, under glass	March 16.
Peas	April 15.

Dates for Sowing or Setting Vegetables, continued.

Potato.....May 3.
Pumpkin .....May 31.
Radish .....April 26.
Salsify .....May 7.
Spinach .....April 10.
Squash.....May 28.
Tomato, under glass.....March 13.
Turnip .....April 15.

BOSTON. (RAWSON.)

Asparagus .....About the end of April.
Bean, Bush ....About the first week in May.
Bean, Pole.....From about the middle of May to the 1st of June.
Bean, Lima.....About the 1st of June.
Beet.....About the middle of April.
Borecole, or Kale.....About the middle of April; plant out in June.
Brussels Sprouts .....In March or April in hot-bed.
Cabbage .....Transplant the last week in April or the first in May.
Carrots.....Last of May or 1st of June.
Cauliflower .....From the 1st of May until the 1st of July.
Celery.....The 1st week in June to the 2d in July.
Corn Sweet .....About the 1st of May.
Cucumber .....For first crop, about the middle of March.
Egg-Plant.....About March 15th in hot-bed.
Endive .....June or July.
Kohl-rabi .....May or June.
Okra .....About the 10th of May.
Peas .....During the last of April up to the 1st of May.
Pepper .....Put out of doors about the 1st of April.

Dates for Sowing or Setting Vegetables, continued.

Radish .....From the 1st of April to the middle of June.
Spinach .....About the 1st of September.
Tomato.....About the 25th of May set plants out doors.
Turnips, for fall use ..Any time from July 1st to August 20th.
Watermelon .....About the middle of May.

NEW YORK. (HENDERSON.)

Plants to sow from the middle of March to the end of April. Thermometer in the shade averaging 45 degrees.

Beet.	Cauliflower.	Parsley.
Carrot.	Endive.	Peas.
Cress.	Kale.	Radish.
Celery.	Lettuce.	Spinach.
Cabbage.	Onions.	Turnip.
	Parsnip.	

From the middle of May to the middle of June. Thermometer in the shade averaging 60 degrees.

Bean, Bush.	Bean, Runner.	Nasturtium.
Bean, Cranberry.	Corn, Sweet,	Okra.
Bean, Lima.	Cucumber.	Pumpkin.
Bean, Pole.	Melon, Musk.	Squash.
Bean, Scarlet.	Melon, Water.	Tomato.

GEORGIA. (OEMLER.)

Asparagus .....From December 1st to the middle of March.
Bean, Bush ....From the 1st to the middle of March.
Beet .....Through November and December.
Cabbage .....From the 1st of October to the 15th. Transplant about November 1st and later.
Cauliflower ....From May to September.
Cucumber .....About March 1st to the 15th.
Egg-Plant.....To prick out, about the middle of January; otherwise ten or fifteen days later.

Dates for Sowing or Setting Vegetables, continued.

Lettuce.....About the middle of September.
Onion .....About January 1st.
Pea .....About December 1st.
Potato.....The 1st of February.
Radish .....From Christmas to the last of February.
Spinach .....From September 10th until October 15th.
Squash .....About the last of February up to the middle of March.
Sweet-Potato...In cold-frames, about the 1st of January.
Tomato.....About January 1st.
Watermelon ...About the 15th of March.

2. Tender and Hardy Vegetables.

Vegetables injured by a slight frost, and which should therefore be planted only after the weather has settled.

All Beans.	Egg-Plant.	Pumpkin.
Corn.	All Melons.	Squash.
Cucumber.	Okra.	Sweet Potato.
	Pepper.	Tomato.

Vegetables which, when properly handled, will endure a frost.

Asparagus.	Corn Salad.	Parsley.
Beet.	Cress.	Parsnip,
Borecole.	Endive.	Pea.
Broccoli.	Horseradish.	Radish.
Brussels Sprouts.	Kale.	Rhubarb.
Cabbage.	Kohl-rabi.	Salsify.
Carrot.	Leek.	Sea Kale.
Cauliflower.	Lettuce.	Spinach.
Celery.	All Onions.	Turnip.

3. Usual Distances Apart for Planting Fruits.

Apples..... 30 to 40 feet each way.
" Dwarf..... 10 " " "
Pears..... 20 " 30 " " "
" Dwarf..... 10 " 12 " " "

Usual Distances Apart for Planting Fruits, continued.

Plums	16 to 20 feet each way.
Peaches	16 " 20 " " "
Cherries	16 " 25 " " "
Apricots	16 " 20 " " "
Nectarines	16 " 20 " " "
Quinces	8 " 12 " " "
Grapes	8 " 12 " " "
Currants	4 × 5 feet
Gooseberries	4 × 5 "
Raspberries, Black	3 × 6 "
" Red	3 × 5 "
Blackberries	4 × 7 to 6 × 8 feet.
Cranberries	1 or 2 ft. apart each way.
Strawberries	1 × 3 or 4 feet.
Oranges and Lemons	25 to 30 feet each way,
Figs	20 " 25 " " "
Mulberries	25 " 30 " " "
Japanese Persimmons	20 " 25 " " "
Loquats	15 " 25 " " "
Pecans	35 " 40 " " "

Distances Recommended for Orange Trees in California.

Dwarfs, as Tangerines	10 to 12 feet.
Half-Dwarfs, as Washington Novel	24 " 30 "
Mediterranean Sweet, Maltese Blood, Valencia	24 " 30 "
St. Michael	18 " 24 "
Seedlings	30 " 40 "

4. Usual Distance Apart for Planting Vegetables.

Artichoke.....Rows 3 or 4 ft. apart, 2 to 3 ft. apart in the row.

Asparagus.....Rows 3 to 4 ft. apart, 1 to 2 ft. apart in the row.

Beans, Bush.....1 ft. apart in rows 2 to 3 ft. apart.

" Pole.....3 to 4 ft. each way.

Usual Distance Apart for Planting Vegetables, continued.

Beet, early.....In drills 12 to 18 in. apart.
" late.....In drills 2 to 3 ft. apart.
Broccoli.....1½ × 2½ ft. to 2 × 3 ft.
Cabbage, early....16 × 28 in. to 18 × 30 in.
" late.....2 × 3 ft. to 2½ × 3½ ft.
Carrot.....In drills 1 to 2 ft. apart.
Cauliflower.....2 × 2 ft. to 2 × 3 ft.
Celery..... Rows 3 to 4 ft. apart, 6 to 9 in. in the row
Corn-Salad.....In drills 12 to 18 in. apart.
Corn, Sweet.....Rows 3 to 3½ ft. apart, 9 in. to 2 ft. in the row.
Cress.....In drills 10 to 12 in. apart.
Cucumber.....4 to 5 ft. each way.
Egg-Plant.....3 × 3 ft.
Endive.....1 × 1 ft. to 1 × 1½ ft.
Horseradish.....1 × 2 or 3 ft.
Kohl-rabi.....10 × 18 in. to 1 × 2 ft.
Leek.....6 in. × 1 or 1½ ft.
Lettuce.....1 × 1½ or 2 ft.
Melons, Musk.....5 to 6 ft. each way.
" Water....7 to 8 ft. each way.
Mushroom.....6 to 8 in. each way.
Okra.....1½ × 2 or 3 ft.
Onion.....In drills from 14 to 20 in. apart.
Parsley.....In drills 1 or 2 ft. apart.
Parsnip.....In drills 18 in. to 3 ft. apart.
Peas..... In drills, early kinds usually in double rows 6 to 9 in. apart, late kinds in single rows 2 to 3 ft. apart.
Pepper.....15 to 18 in. × 2 to 2½ ft.
Potato.....10 to 18 in. × 2½ to 3 ft.
Pumpkin.....8 to 10 ft. each way.
Radish.....In drills 10 to 18 in. apart.
Rhubarb.....2 to 4 ft. × 4 ft.
Salsify.....In drills 1½ to 2 ft. apart.

Usual Distance Apart for Planting Vegetables, continued.

Sea Kale.....2 × 2 to 3 ft.
Spinach .....In drills 12 to 18 in. apart.
Squash, Bush .....3 to 4 ft. × 4 ft.
" Late .....6 to 8 ft. each way.
Sweet-Potato.....2 ft. × 3 to 4 ft.
Tomato.....4 ft. × 4 to 5 ft.
Turnip .....In drills 1½ to 2½ ft. apart.

5. Number of Plants Required to Set an Acre of Ground at Given Distances.

	Plants.		Plants.
1 in. × 1 in	6,272,640	3 in. × 5 in.....	418,175
1 " × 2 "	3,136,320	3 " × 6 "	348,480
1 " × 3 "	2,090,880	3 " × 7 "	298,697
1 " × 4 "	1,568,160	3 " × 8 "	261,360
1 " × 5 "	1,254,528	3 " × 9 "	232,320
1 " × 6 "	1,045,440	3 " × 10 "	209,088
1 " × 7 "	896,091	3 " × 11 "	190,080
1 " × 8 "	784,080	3 " × 12 "	174,240
1 " × 9 "	696,960	4 " × 4 "	392,040
1 " × 10 "	627,269	4 " × 5 "	313,632
1 " × 11 "	570,240	4 " × 6 "	261,360
1 " × 12 "	522,720	4 " × 7 "	224,022
2 " × 2 "	1,568,160	4 " × 8 "	196,020
2 " × 3 "	1,045,440	4 " × 9 "	174,240
2 " × 4 "	784,080	4 " × 10 "	156,816
2 " × 5 "	627,264	4 " × 11 "	142,560
2 " × 6 "	522,720	4 " × 12 "	130,680
2 " × 7 "	448,045	5 " × 5 "	250,905
2 " × 8 "	392,040	5 " × 6 "	209,088
2 " × 9 "	348,480	5 " × 7 "	179,218
2 " × 10 "	313,632	5 " × 8 "	156,816
2 " × 11 "	285,120	5 " × 9 "	139,392
2 " × 12 "	261,360	5 " × 10 "	125,452
3 " × 3 "	696,960	5 " × 11 "	114,048
3 " × 4 "	522,720	5 " × 12 "	104,544

Number of Plants to an Acre at Given Distances, continued.

			Plants.				Plants.
6 in.	×	6 in.	174,240	12 in.	×	12 in.	43,560
6 "	×	7 "	149,348	12 "	×	15 "	34,848
6 "	×	8 "	130,680	12 "	×	18 "	29,040
6 "	×	9 "	116,160	12 "	×	20 "	26,136
6 "	×	10 "	104,544	12 " or 1 ft.	×	24 " or 2 ft.	21,780
6 "	×	11 "	95,040				
6 "	×	12 "	87,120	12 in.	×	30 "	17,424
7 "	×	7 "	128,013	12 "	×	36 " or 3 ft.	14,520
7 "	×	8 "	112,011	12 "	×	42 "	12,446
7 "	×	9 "	99,562	12 "	×	48 " or 4 ft.	10,890
7 "	×	10 "	89,609	12 "	×	54 "	9,680
7 "	×	11 "	81,462	12 "	×	60 " or 5 ft.	8,712
7 "	×	12 "	74,674	15 "	×	15 "	27,878
8 "	×	8 "	98,010	15 "	×	18 "	23,232
8 "	×	9 "	87,120	15 "	×	20 "	20,908
8 "	×	10 "	78,408	15 "	×	24 " or 2 ft.	17,424
8 "	×	11 "	71,280	15 "	×	30 "	13,939
8 "	×	12 "	65,340	15 "	×	36 " or 3 ft.	11,616
9 "	×	9 "	77,440	15 "	×	42 "	9,953
9 "	×	10 "	69,696	15 "	×	48 " or 4 ft.	8,712
9 "	×	11 "	63,360	15 "	×	54 "	7,744
9 "	×	12 "	58,080	15 "	×	60 " or 5 ft.	6,969
10 "	×	10 "	62,726	18 "	×	18 "	19,360
10 "	×	12 "	52,272	18 "	×	20 "	17,424
11 "	×	15 "	41,817	18 "	×	24 " or 2 ft.	14,520
10 "	×	18 "	34.848	18 "	×	30 "	11,616
10 "	×	20 "	31,362	18 "	×	36 " or 3 ft.	9,680
10 "	×	24 " or 2 ft.	26,132	18 "	×	42 "	8,297
10 "	×	30 "	20,908	18 "	×	48 " or 4 ft.	7,260
10 "	×	36 " or 3 ft.	17,424	18 "	×	54 "	6,453
10 "	×	42 "	14,935	18 "	×	60 " or 5 ft.	5,808
10 "	×	48 " or 4 ft.	13,068	20 "	×	20 "	15,681
10 "	×	54 "	11,616	20 "	×	24 " or 2 ft.	13,168
10 "	×	60 " or 5 ft.	10,454	20 "	×	30 "	10,454

Number of Plants to an Acre at Given Distances, continued.

	Plants.		Plants.
20 in. × 36 in. or 3 ft.	8,712	3 ft. × 9 ft.	1,613
20 " × 42 "	7,467	3 " × 10 "	1,452
20 " × 48 " or 4 ft.	6,534	3 " × 11 "	1,320
20 " × 54 "	5,308	3 " × 12 "	1,210
20 " × 60 " or 5 ft.	5,227	4 " × 4 "	2,722
1 ft. × 1 ft.....	43,560	4 " × 5 "	2,178
1 " × 2 "	21,780	4 " × 6 "	1,815
1 " × 3 "	14,520	4 " × 7 "	1,556
1 " × 4 "	10,890	4 " × 8 "	1,361
1 " × 5 "	8,712	4 " × 9 "	1,210
1 " × 6 "	7,260	4 " × 10 "	1,089
1 " × 7 "	6,223	4 " × 11 "	990
1 " × 8 "	5,445	4 " × 12 "	907
1 " × 9 "	4,840	5 " × 5 "	1,742
1 " × 10 "	4,356	5 " × 6 "	1,452
1 " × 11 "	3,960	5 " × 7 "	1,244
1 " × 12 "	3,630	5 " × 8 "	1,089
2 " × 2 "	10,890	5 " × 9 "	968
2 " × 3 "	7,260	5 " × 10 "	871
2 " × 4 "	5,445	5 " × 11 "	792
2 " × 5 "	4,356	5 " × 12 "	726
2 " × 6 "	3,630	6 " × 6 "	1,210
2 " × 7 "	3,111	6 " × 7 "	1,037
2 " × 8 "	2,722	6 " × 8 "	907
2 " × 9 "	2,420	6 " × 9 "	806
2 " × 10 "	2,178	6 " × 10 "	726
2 " × 11 "	1,980	6 " × 11 "	660
2 " × 12 "	1,815	6 " × 12 "	605
3 " × 3 "	4,840	7 " × 7 "	888
3 " × 4 "	3,630	7 " × 8 "	777
3 " × 5 "	2,904	7 " × 9 "	691
3 " × 6 "	2,420	7 " × 10 "	622
3 " × 7 "	2,074	7 " × 11 "	565
3 " × 8 "	1,815	7 " × 12 "	518

Number of Plants to an Acre at Given Distances, continued.

	Plants.		Plants.
8 ft. × 8 ft.	680	12 ft. × 48 ft.	75
8 " × 9 "	605	12 " × 54 "	67
8 " × 10 "	544	12 " × 60 "	60
8 " × 11 "	495	15 " × 15 "	193
8 " × 12 "	453	15 " × 18 "	161
9 " × 9 "	537	15 " × 20 "	145
9 " × 10 "	484	15 " × 24 "	121
9 " × 11 "	440	15 " × 30 "	96
9 " × 12 "	403	15 " × 36 "	80
9 " × 14 "	345	15 " × 42 "	69
9 " × 15 "	322	15 " × 48 "	60
9 " × 18 "	268	15 " × 54 "	53
9 " × 20 "	242	15 " × 60 "	48
10 " × 10 "	435	18 " × 18 "	134
10 " × 12 "	363	18 " × 20 "	121
10 " × 15 "	290	18 " × 24 "	100
10 " × 18 "	242	18 " × 30 "	80
10 " × 20 "	217	18 " × 36 "	67
10 " × 24 "	181	18 " × 42 "	57
10 " × 30 "	145	18 " × 48 "	50
10 " × 36 "	121	18 " × 54 "	44
10 " × 42 "	103	18 " × 60 "	40
10 " × 45 "	96	20 " × 20 "	108
10 " × 48 "	90	20 " × 24 "	90
10 " × 54 "	80	20 " × 30 "	72
10 " × 60 "	72	20 " × 36 "	60
12 " × 12 "	302	20 " × 42 "	51
12 " × 15 "	242	20 " × 48 "	45
12 " × 18 "	201	20 " × 54 "	40
12 " × 20 "	181	20 " × 60 "	36
12 " × 24 "	151	24 " × 24 "	75
12 " × 30 "	121	24 " × 30 "	60
12 " × 36 "	100	24 " × 36 "	50
12 " × 42 "	86	24 " × 42 "	43

Number of Plants to an Acre at Given Distances, continued.

	Plants.		Plants.
24 ft. × 48 ft.	37	36 ft. × 54 ft.	22
24 " × 54 "	33	36 " × 60 "	20
24 " × 60 "	30	42 " × 42 "	24
30 " × 30 "	48	42 " × 48 "	21
30 " × 36 "	40	42 " × 54 "	19
30 " × 42 "	34	42 " × 60 "	17
30 " × 48 "	30	48 " × 48 "	18
30 " × 54 "	26	48 " × 54 "	16
30 " × 60 "	24	48 " × 60 "	15
36 " × 36 "	33	54 " × 54 "	14
36 " × 42 "	28	54 " × 60 "	13
36 " × 48 "	25	60 " × 60 "	12

CHAPTER XI.

MATURITIES, YIELDS AND MULTIPLICATION.

1. Time Required for Maturity of Different Garden Crops, Reckoned from the Sowing of the Seeds.

Beans, String	45– 60	days from seed.
" Shell	65– 70	" " "
Beets, Turnip	65	" " "
" Long Blood	150	" " "
Cabbage, Early	105	" " "
" Late	150	" " "
Cauliflower	110	" " "
Corn	75	" " "
Egg-Plant	150–160	" " "
Lettuce	65	" " "
Melon, Water	120–140	" " "
" Musk	120–140	" " "
Onion	135–160	" " "
Pepper	140–150	" " "
Radish	30– 45	" " "
Squash, Summer	60– 65	" " "
" Winter	125	" " "
Tomatoes	150	" " "
Turnips	60	" " "

2. Time Required, from Setting, for Fruit Plants to Bear.

Apple—3 years Good crop in about 10 years.

Blackberry—1 year. Good crops in 2 and 3 years.

Citrus fruits (oranges, lemons, etc.)—2 to 3 years. Good crops in 2 or 3 years later.

Time required, from Setting, for Fruit Plants to Bear, continued.

Cranberry—3 years gives a fair crop.
Currant—1 year. Good crop in 2 and 3 years.
Gooseberry—1 year. Good crop in 2 and 3 years.
Grape—Fair crop in 4 years.
Peach—2 years. Good crop in 4 years,
Pear—3 or 4 years. Fair crop in 12 years.
Persimmon, or Kaki—1 to 3 years.
Quince—2 years. Good crop in 4 years.
Raspberry—1 year. Good crops in 2 and 3 years.
Plum—3 years. Good crop in 5 or 6 years.
Strawberry—1 year. Heaviest crop usually in 2 years.

3. Average Profitable Longevity of Fruit Plants under High Culture.

Apple .....25–40 years.
Blackberry .....12–15 "
Currant .....20 "
Gooseberry .....20 "
Orange and Lemon, 50 or more.
Peach .....8–12 "
Pear .....50–75 years.
Persimmon, or Kaki, as long as an apple tree.
Plum.....20–25 "
Raspberry .....12–15 "
Strawberry .....3 "

4. Average Yields Per Acre of Various Crops.

The yields of those crops in which the salable products are equal in number to the number of plants per acre, and in which the product is sold by the piece, are to be calculated from the planting tables in Chapter X. Such are cabbage, celery, and the like.

Apples—A tree 20 to 30 years old may be expected to yield from 25 to 40 bus. every alternate year.

Artichoke—200 to 300 bus.
Beans, Green or Snap—75 to 120 bus.
" " Lima—75 to 100 bu. of dry beans.
Beet—400 to 700 bus.
Carrots—400 to 700 bus.
Corn—50–75 bus., shelled.

Average Yields per Acre of Various Crops, continued.

Cranberry—100 to 300 bus. 900 bus. have been reported.

Cucumber—About 150,000 fruits per acre.

Currant—100 bus.

Egg-Plant—One or two large fruits to the plant for the large sorts like New York Purple, and from three to eight fruits for the smaller varieties.

Gooseberry—100 bus.

Grape—3 to 5 tons. Good raisin vineyards in California, 15 years old, will produce from 10 to 12 tons.

Horse-radish—3 to 5 tons.

Kohl-rabi—500 to 1,000 bus.

Onion, from seed—300 to 800 bus. 600 bus. is a large average yield.

Parsnips—500 to 800 bus.

Pea, green, in pod—100 to 150 bus.

Peach—In full bearing, a peach tree should produce from 5 to 10 bus.

Pear—A tree 20 or 25 years old should give from 25 to 45 bus.

Pepper—30,000 to 50,000 fruits.

Plum—5 to 8 bus. may be considered an average crop for an average tree.

Potato—100 to 300 bus.

Quince—200 to 400 bus.

Raspberry and Blackberry—50 to 100 bus.

Salsify—200 to 300 bus.

Spinach—200 barrels.

Strawberry—75 to 250, or even 300 bus

Tomato—8 to 16 tons.

Turnip—600 to 1,000 bus.

5. Tabular Statement of the Ways in which Plants are Propagated.

PROPAGATION OF PLANTS.*

- *A.* By Seeds.—*Seedage*
  - *a.* Open air seedage.
  - *b.* Confined seedage
- *B.* By Buds
  - I. On their own roots
    - 1. By undetached parts.—*Layerage*.
      - *a.* Stools.
      - *b.* Root-tips.
      - *c.* Stolons.
      - *d.* Runners.
      - *e.* Layers proper.
        - Simple.
        - Serpentine.
        - Chinese.
    - 2. By detached parts
      - 1. By undivided parts.—*Separation* (Bulbs, corms, bulblets, bulb-scales, tubers, etc.).
      - 2. By divided parts
        - I. Division.
        - II. *Cuttage* (Cuttings)
          - *a.* Of stems.
            - Growing wood.
            - Ripened wood.
          - *b.* Of rootstocks.
          - *c.* Of roots.
          - *d.* Of leaves.
  - II. On roots of other plants.—*Graftage*.
    - 1. By detached scions
      - I. Budding:
        - Shield.
        - Flute.
      - II. Grafting:
        - Cutting.
        - Veneer.
        - Splice.
        - Saddle. Whip. Crown.
    - 2. By undetached scions.—*Inarching*.

* Modified from a synopsis prepared by B. M. Watson, Jr., Bussey Institution.

6. Ways of Grafting and Budding. (Baltet.)

GRAFTING WITH UNDETACHED SCIONS. (INARCHING).

1.—Method by veneering.
" " inlaying.
English method.
2.—Inarching with an eye.
" " a branch.

GRAFTING WITH DETACHED SCIONS.

1.—Side-grafting under the bark.
" " with a simple branch.
" " with a heeled branch.
" " in the albumum.
" " with a straight cleft.
" " with an oblique cleft.
2.—Crown-grafting.
Ordinary method.
Improved method.
3.—Grafting de precision.
Veneering, common method.
" in crown-grafting.
" with strips of bark.
Crown-grafting by inlaying.
Side-grafting by inlaying.
4.—Cleft-grafting, common single.
" " " double.
" " oblique.
" " terminal.
" " " woody.
" " " herbaceous.
5.—Whip-grafting, simple.
" " complex.
Saddle-grafting.
6.—Mixed-grafting.
Grafting with cuttings.
When the scion is a cutting.

Ways of Grafting and Budding, continued.

When the stock is a cutting
When both are cuttings.
Root-grafting of a plant on its own root.
" " " " the roots of another plant.
Grafting with fruit buds.

BUD-GRAFTING. (BUDDING.)

1.—Grafting with shield-buds.
Bud-grafting under the bark, or by inoculation.
" " ordinary method.
" " with a cross-shaped incision.
" " " the incision reversed.
" " by veneering.
Bud-grafting, the combined or double method.
2.—Flute-grafting.
" " common method.
" " with strips of bark.

7. Particular Methods by which Various Fruits are Multiplied.

Barberry .....Cuttings of mature wood; seeds.
Orange .....Seeds; seedlings budded or grafted.
Figs.....Cuttings, either of soft or mature wood.
Mulberry .....Cuttings of mature wood. Some varieties are root-grafted.
Olive.....Cuttings of mature or even old wood. Chips from the trunk of old trees are sometimes used.
Pomegranate...Cuttings, layers and seeds.
Apple and Pear. Seeds; seedlings budded or grafted.
Peach and other stone fruits—
Seeds; seedlings budded.
Quince .....Cuttings usually.
Grape.....Cuttings of from one to three buds; layers.
Currant and Gooseberry—
Cuttings.
Raspberries, red. Suckers from the root; root cuttings.

Particular Methods by which Fruits are Multiplied, continued.

Raspberries, bl'k..Layers from tips of canes; root cuttings.
Blackberry .....Root cuttings; suckers from the root.
Cranberry.....Layers or divisions.
Strawberry .....Runners; tip cuttings.

8. Stocks Used for Various Fruits.

Almond.....Peach, hard-shelled almond, plum.
Apple .....Common apple seedlings, Paradise and Doucin stocks, crab-apple and wild crab.
Apricot.....Apricot and peach in mild climates and plum in severe ones.
Cherry .....Mazzard stocks are preferred for standards; Mahaleb stocks are used for dwarfing.
Medlar .....Hawthorn, medlar, quince.
Mulberry.....Seedlings of white mulberry.
Orange .....Otaheite orange, shaddock; *Limonia trifoliata*, particularly for dwarfs.
Peach and Nectarine..Peach. Plum is often used when dwarfs are wanted, or when the peach must be grown in a too severe climate or upon heavy soil.
Pear .....Pear; quince, mountain ash, or thorn for dwarfs. Apple temporarily.
Persimmon, Japanese Native persimmon.
Plum.....Plum, Myrobalan plum, peach.
Quince .....The finer varieties are sometimes grafted upon strong growing kinds like the Angers.

CHAPTER XII.

Methods of Keeping and Storing Fruits and Vegetables.

Apples.—

1. Keep the fruit as cool as possible without freezing. Select only normal fruit, and place it upon trays in a moist but well ventilated cellar. If it is desired to keep the fruit particularly nice, allow no fruits to touch each other upon the trays, and the individual fruits may be wrapped in tissue paper. For market purposes, pack tightly in barrels, and store the barrels in a very cool place.

2. Some solid apples, like Spitzenberg, are not injured by hard freezing, if they are allowed to remain frozen until wanted and are then thawed out very gradually.

3. Many apples, particularly russets and other firm varieties, keep well when buried after the manner of pitting potatoes. Sometimes, however, they taste of the earth. This may be prevented by setting a ridge pole over the pile of apples in forked sticks, and making a roof of boards in such manner that there will be an air space over the fruit. Then cover the boards with straw and earth. Apples seldom keep well after removal from a pit in spring.

4. Apples may be kept by burying in chaff. Spread chaff—buckwheat-chaff is good—on the barn floor, pile on the apples and cover them with chaff and fine broken or chopped straw two feet thick, exercising care to fill the interstices.

Pears.—Pears should be picked several days or a couple weeks before they are ripe, and then placed in a dry and well ventilated room, like a chamber. Make very shallow piles, or, better, place on trays.

Figs.—After the figs are gathered and dried in the same way as peaches or apricots, wash to remove all grit, and spread on shallow pans and set them in the oven to become thoroughly heated, taking care to prevent scorching. Then roll in powdered sugar, which has been rolled to remove all lumps. When cold, pack away, preferably in paper bags. They make a delicious lunch with a bowl of milk. They also help to make a nice dessert.

Gooseberries keep well if kept tight in common bottles filled with pure water. Be sure that none but perfect berries are admitted, and keep in a cool place.

Grapes.—

1. The firm grapes usually keep best, as Catawba, Vergennes, Niagara, Diana, Jefferson, etc. Thickness of skin does not appear to be correlated with good keeping qualities. Always cut the bunches which are to be stored on a dry day, when the berries are ripe, and carefully remove all soft, bruised or imperfect fruits and all leaves. Keep the fruit dry, cool, and away from currents of air. Many varieties keep well if simply placed in shallow boxes or baskets and kept undisturbed in a cool place.

2. Pack the bunches in layers of dry clean sand.

3. Pack in layers in some small grain, as wheat, or oats, or barley.

4. Cork dust is also excellent for use in packing grapes. This cork can be had from grocers who handle the white Malagas, which are packed in this material.

5. Pack the bunches in finely cut soft and dry hay, placing the grapes and hay in consecutive layers.

6. Dry hardwood saw-dust is also good for packing.

Grapes, continued.

7. Place on shelves in a cool, airy room. After a few days wrap the bunches separately in soft paper and pack in shallow pasteboard boxes not more than two or three layers deep. Keep in a cool, dry room that is free from frost.

8. Cut the bunches with sharp scissors, place in shallow baskets or but few in a basket, and after reaching the house dip the cut ends of stems in melted wax. Now take tissue paper or very thin manilla paper cut just to the right size, and carefully envelope each cluster of grapes. Secure shallow tin boxes; place a layer of cotton batting at the bottom, then a layer of grapes, then batting; three layers of grapes are enough for one box, alternating with cotton batting, and topping with batting; then gently secure the lid to each box, and when done place in cold storage for use in April or even later. If cold storage cannot be had put in a dry, cool room, and when cold weather approaches cover in an interior closet with just sufficient covering to prevent freezing; warmth will cause over-ripening and deterioration.

9. Roe's Method.—In a stone jar place alternate layers of grapes and straw paper, the paper being in double thickness. Over the jar paste a cloth and bury below frost in a dry soil. The grapes will keep until New Year.

Keeping Grapes for Market (W. M. Pattison, Quebec).—It is the generally received opinion that the thick-skinned native seedlings are the only keepers. This is correct as regards preserving flavor, but several hybrids of foreign blood are the best keepers known. Before giving results of this and former trials, instructions in packing may be of service. The varieties intended to be laid up for winter use should be those only which adhere well to the stem and are not inclined to shrivel. These should be allowed to remain on the vines as long as they are safe

Grapes, continued.

from frost. A clear dry day is necessary for picking, and careful handling and shallow baskets are important. The room selected for the drying process should be well ventilated, and the fruit laid out in single layers on tables or in baskets where the air circulates freely, the windows being closed at night and in damp weather. In about ten days the stems will be dried out sufficiently to prevent moulding when laid away. When danger from this is over and the stems resemble those of raisins, the time for packing has arrived. In this, the point to be observed is to exclude air proportionately with their tendency to mould. I have used baskets for permanent packing, but much prefer shallow trays or boxes of uniform size to be packed on each other, so that each box forms a cover for the lower, the uppermost only needing one. Until very cold weather, the boxes can be piled so as to allow the remaining moisture to escape through a crevice about the width of a knife blade. Before packing, each bunch should be examined, and all injured, cracked and rotten berries removed with suitable scissors. If two layers are packed in a box, a sheet of paper should intervene. The boxes must be kept in a dry cool room, or passage, at an even temperature. If the thermometer goes much below freezing point, a blanket or newspaper can be thrown over them, to be removed in mild weather. Looking over them once in the winter and removing defective berries will suffice, the poorest keepers being placed accessible. Under this treatment the best keepers will be in good edible order as late as February, after which they deteriorate.

The following is a list of the grapes worth noticing that have been tested for keeping:

Grapes, continued.

	Description.	List of Grapes to be Recommended.
Varieties Keeping Well until—	Nov. 1st	Lady, Antoinette, Carlotta, Belinda.
	Dec. 1st.	Lady Washington, Peter Wiley, Mason's Seedling, Worden, Senasqua, Romell's Superior, Ricketts' No. 546, Concord, Delaware.
	Jan. 1st.	Duchess, Essex, Barry, Rockland Favorite, Aminia, Garber's New Seedling, Massasoit, Dempsey's No 5, Burnett, Undine, Allen's Hybrid, Agawam, Gen. Pope, Francis Scott.
	Jan. 15th.	Salem, Vergennes, El Dorado.
	Feb. 1st.	Wilder, Herbert, Peabody, Roger's No. 30, Gærtner, Mary and Owosso.

Crystallized or **Glacé Fruit.**—The principle is to extract the juice from the fruit and replace it with sugar syrup, which hardens and peserves the fruit in its natural shape. The fruit should all be of one size and of a uniform degree of ripeness, such as is best for canning. Peaches, pears and similar fruits are pared and cut in halves; plums, cherries, etc., are pitted. After being properly prepared the fruit is put in a basket or bucket with a perforated bottom and immersed in boiling water to dilute and extract the juice. This is the most important part of the process, and requires great skill. If the fruit be left too long, it is over-cooked and becomes soft; if not long enough the juice is not sufficiently extracted, and this prevents perfect absorption of the sugar. After the fruit cools, it may again be assorted as to softness. The syrup is made of white sugar and water. The softer the fruit the heavier the syrup required. The fruit is placed in earthern pans, covered with syrup, and left about a week. This is a critical stage, as fermentation will soon

Crystallized or Glacé Fruit continued.

take place, and when this has reached a certain stage the fruit and syrup are heated to the boiling point, which checks the fermentation. This is repeated, as often as may be necessary, for about six weeks. The fruit is taken out of the syrup, washed in clean water, and either glacéd or crystallized, as desired. It is dipped in thick sugar syrup, and hardened quickly in the open air for glacing, or left to be hardened slowly if to be crystallized. The fruit is now ready for packing, and is said to keep in any climate.

Cabbage.—The most satisfactory method of keeping cabbages is to bury them in the field. Select a dry place, pull the cabbages and stand them head down on the soil. Cover them with soil to the depth of six or ten inches, covering very lightly at first to prevent heating—unless the weather should quickly become severe—and as winter sets in cover with a good dressing of straw or coarse manure. The cabbages should be allowed to stand where they grew until cold weather approaches. The storing beds are usually made about six or eight feet wide, so that the middle of the bed can be reached from either side, and to prevent heating if the weather should remain open. Cabbages quickly decay in the warm weather of spring.

Celery.—For market purposes, celery is stored in temporary board-pits, in sheds, in cellars, and in various kinds of earth pits and trenches. The points to be considered are, to provide the plants with moisture to prevent wilting, to prevent hard freezing, and to give some ventilation. The plants are set loosely in the soil. There are several methods of keeping celery in an ordinary cellar for home use. The following methods are good:

Take a shoe or similar box. Bore one inch holes in the sides, four inches from bottom. Put a layer of sand or soil in the box, and stand the plants, trimmed carefully, upon it, closely together, working more sand or soil about

Celery, continued.

the root part, and continue until the box is full. The soil should be watered as often as needed, but always through the holes in the side of the box. Keep the foliage dry.

Celery may also be stored and beautifully bleached at the same time, in a similar way by standing in a barrel upon a layer of soil. Some roots and soil may be left adhering to the plants. Crowd closely, water through holes near the bottom as in case of box storage, and keep the plants in the dark.

Blanched celery can also be preserved for a long time by trimming closely and packing upright in moist moss inside of a box. A large quantity of the vegetable may thus be stored in a small space.

Onions demand a dry cellar, and the bulbs should be thoroughly dried in the sun before they are stored. All tops should be cut away when the onions are harvested. If a cellar cannot be had, the bulbs may be allowed to freeze, but great care must be exercised or the whole crop will be lost. The onions must not be subjected to extremes of temperature, and they should not thaw out during the winter. They can be stored on the north side of a loft, being covered with two or three feet of straw, hay or chaff to preserve an equable temperature. They must not be handled while frozen, and they must thaw out very gradually in spring. This method of keeping onions is reliable only when the weather is cold and tolerably uniform.

Orange.—Aside from the customary wrapping of oranges in tissue paper and packing them in boxes, burying in dry sand is sometimes practiced. The fruit is first wrapped in tissue paper, and it should be buried in such manner that the fruit shall not be more than three tiers deep.

Roots of all sorts, as beets, carrots, salsify, parsnips, can be kept from wilting by packing them in damp sphag-

Roots, continued.

num moss, like that used by nurserymen. They may also be packed in sand. It is an erroneous notion that parsnips and salsify are not good until after they are frozen

Squashes should be stored in a dry room in which the temperature is uniform and about 50°. Growers for market usually build squash houses or rooms and heat them. Great care should be taken not to bruise any squashes which are to be stored. Squashes procured from the market have usually been too roughly handled to be reliable for storing.

Sweet potatoes.—IN THE NORTH, dig the potatoes on a sunny day and allow them to dry thoroughly in the field. Sort ut the poor ones, and handle the remainder carefully. Iever allow them to become chilled. Then pack them in barrels in layers, in dry sand, and store in a warm cellar. They are sometimes stored in finely broken charcoal, in charcoal dust, wheat chaff and similar substances.

Sometimes they are kept in small and open crates, without packing material, the crates being stacked so as to allow thorough ventilation. The Hayman or Southern Queen keeps well in this way.

A warm attic is often a good place in which to store sweet potatoes. A tight room over a kitchen is particularly good when it is so arranged that the heat from the kitchen can be utilized in warming it.

IN THE SOUTH (Berckmans).—Digging the tubers should e delayed until the vines have been sufficiently touched y frost to check vegetation. Allow the potatoes to dry off in the field, which will take but a few hours. Then sort all those of eating size to be banked separately from the smaller ones. The banks are prepared as follows: Make a circular bed six feet in diameter in a sheltered corner of the garden, throwing up the earth about a foot high. Cover this with straw and bank up the tubers in

Sweet potatoes, continued.

shape of a cone, using from 10 to 20 bushels to each bank. A triangular pipe made of narrow planks to act as a ventilator should be placed in the middle of the cone. Cover the tubers with straw 6 to 10 inches thick and bank the latter with earth, first using only a small quantity, but increasing the thickness a week or ten days afterwards. A board should be placed upon the top of the ventilating pipe to prevent water from reaching the tubers. Several banks are usually made in a row, and a rough shelter of boards built over the whole. The main point to be considered in putting up sweet potatoes for winter is entire freedom from moisture and sufficient covering to prevent heating. It is therefore advisable to allow the tubers to undergo sweating (which invariably occurs after being put in heaps) before covering them too much, and if the temporary covering is removed for a few hours, a week after being heaped, the moisture generated will be removed and very little difficulty will follow from that cause. If covered too thickly at once, the sweating often engenders rapid fermentation, and loss is then certain to follow. Sand is never used here in banking potatoes. Some varieties of potatoes keep much better than others. The Yellow Sugar Yam and the Pumpkin Yam are the most difficult to carry through, while the Trinidad potato keeps as readily as Irish potatoes, only requiring to be kept free from frost and light by a slight covering of straw if the tubers are placed in a house. Next in keeping quality come the Hayti Yam, the Red-skinned, Brimstone, Nigger Killer, and last of the potato section is the Nansemond

Tomatoes.—Pick the firmest fruits just as they are beginning to turn, leaving the stems on, exercising care not to bruise them, and pack in a barrel or box in clean and thoroughly dry sand, placing the fruits so that they will not touch each other. Place the barrel in a dry place.

CHAPTER XIII.

Standard and Legal Measures and Sizes.

1. Standard Flower Pots.

American.

The Society of American Florists has adopted a standard pot, in which all measurements are made inside, and which bears a rim or shoulder at the top. The breadth and depth of these pots are the same, so that they "nest" well.

English—Chiswick Standards.

	Diam. at top.	Depth.
Thimbles	2 in.	2 in.
Thumbs	2½	2½
60's	3	3½
54's	4	4
48's	4½	5
32's	6	6
24's	8½	8
16's	9½	9
12's	11½	10
8's	12	11
6's	13	12
4's	15	13
2's	18	14

2. Legal and Stan

Legal Weights of a Bushel of Produce

States.	Apples.	Apples, dried.	Beans, Castor.	Beans, White.	Buckwheat.	Corn, ear.	Corn, shelled.	Corn-meal.	Onions.	Oats.
Arkansas	..	24	..	60	52	70	56	48	57	32
California	..	..	..	..	40	..	52	..	..	32
Colorado	..	..	..	60	52	70	56	50	57	32
Connecticut	..	..	..	60	48	..	56	50	50	32
Delaware	..	..	..	..	..	..	56	48	..	..
Georgia	..	24	..	60	52	70	56	48	57	32
Illinois	..	24	46	60	52	70	56	48	57	32
Indiana	..	25	66	60	50	68	56	50	48	32
Iowa	48	48	46	60	52	70	56	..	57	32
Kansas	..	24	44	60	50	70	56	50	57	32
Kentucky	..	24	45	60	56	70	56	50	57	32
Louisiana	..	..	..	..	..	..	56	..	..	32
Maine	44	..	60	60	48	..	56	50	52	32
Maryland	..	28	60	60	48	70	56	48	56	26
Massachusetts	..	..	..	..	48	..	56	50	52	32
Michigan	48	22	46	60	48	70	56	50	54	32
Minnesota	..	28	..	..	42	..	56	..	..	32
Missouri	48	24	46	60	52	..	56	50	57	32
Nebraska	..	24	46	60	52	70	56	50	57	32
Nevada	..	..	..	60	..	..	56	50	..	..
New Hampshire	..	..	..	62	..	..	56	50	..	32
New Jersey	50	25	60	60	50	..	56	..	57	30
New York	..	..	..	62	48	..	58	..	..	32
North Carolina	..	..	..	..	50	..	56	48	..	32
Ohio	48	22	..	60	50	68	56	..	50	32
Oregon	45	..	..	..	42	..	56	..	..	36
Pennsylvania	..	..	..	..	48	..	56	..	..	32
Rhode Island	..	..	..	..	..	..	56	50	52	32
Tennessee	50	24	..	60	50	70	56	50	56	32
Texas	..	..	..	60	42	..	56	..	57	32
Vermont	46	..	60	62	48	..	56	..	52	32
Virginia	..	28	..	60	52	70	56	50	57	32
West Virginia	..	25	.	60	52	..	56	..	..	32
Wisconsin	56	28	..	60	50	..	56	..	50	32
Washington	45	..	..	..	..	..	..	..	..	..

dard Measures.

in various States, corrected to 1887.

Peaches.	Potatoes, Irish.	Potatoes, Sweet.	Peas.	Rye.	Bluegrass seed.	Clover seed.	Flax seed.	Barley.	Hemp seed.	Millet seed.	Sorghum seed.	Timothy seed.	Turnips.	Wheat.
..	60	50	60	56	14	60	56	48	..	50	50	60	57	60
..	..	..	..	54	..	..	..	50	..	..	..	..	..	60
..	60	..	..	56	14	60	..	48	44	..	..	45	..	60
..	60	..	60	56	..	..	..	48	..	..	..	..	50	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	60
38	60	55	60	56	14	60	56	47	..	..	..	45	55	60
33	60	55	..	56	14	60	55	48	44	..	..	45	55	48
33	60	55	..	56	..	60	..	48	44	..	..	45	..	48
33	60	46	..	56	14	60	56	48	44	45	30	45	..	..
33	60	50	..	56	14	60	56	48	44	50	..	45	55	60
39	60	55	60	56	14	60	56	47	44	50	..	45	60	60
..	..	..	..	32	..	..	..	32	..	..	..	..	..	60
..	60	..	60	..	..	..	..	48	..	..	..	..	50	60
40	60	56	62	56	14	64	56	48	44	50	..	45	56	60
..	60	..	..	56	..	..	..	48	..	..	..	45	..	60
28	60	56	60	56	14	60	56	48	44	50	..	45	58	48
28	60	..	..	56	..	60	..	48	..	..	..	..	..	60
33	60	56	60	56	14	60	56	48	44	..	..	45	12	60
33	60	50	60	56	14	60	56	48	44	40	30	45	55	60
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	60	..	60	56	..	60	..	..	..	..	..	..	..	60
..	60	54	60	56	..	64	55	48	..	..	..	..	50	..
..	60	..	60	56	..	60	55	48	..	..	..	44	..	..
..	60	..	60	56	..	60	55	48	..	..	..	..	..	60
48	60	50	60	56	..	60	56	48	44	50	..	45	60	60
..	60	..	..	56	..	60	..	46	..	..	..	..	..	60
..	56	..	..	56	..	62	..	47	.	..	..	..	..	..
..	60	..	..	56	..	..	..	48	..	..	..	..	..	..
50	60	50	60	..	14	60	56	48	..	50	..	45	50	60
..	60	55	..	56	..	60	56	48	..	..	..	45	55	60
..	60	..	60	56	..	60	..	48	..	..	..	45	..	60
40	60	56	60	56	14	60	56	48	44	50	..	45	55	60
33	60	..	..	56	..	60	56	48	..	..	..	45	..	60
28	60	..	..	56	..	60	56	48	..	..	..	45	42	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

3. Miscellaneous Legal Weights per Bushel.

BEETS: 60 lbs. in Maine, Vermont, Connecticut. CARROTS: 50 lbs. in Maine and Vermont, 55 in Connecticut. PARSNIPS: 45 lbs. in Connecticut. SWEET POTATOES: 54 lbs. in New Jersey, 46 in Dakota, 50 in Ohio, Kansas, Nebraska, 55 in Indiana, Kentucky, Texas, Georgia, 56 in Michigan, Virginia, Missouri, 46 in Iowa. BERRIES: 32 lbs. in Rhode Island. CHERRIES, GRAPES, CURRANTS, GOOSEBERRIES, weigh 40 lbs. in Iowa. BLACKBERRIES, STRAWBERRIES, RASPBERRIES, 32 lbs. in Iowa. PEACHES, QUINCES, 48 lbs. in Iowa, DRIED PLUMS, 28 lbs. in Michigan. CRANBERRIES, 40 lbs. in Michigan. "WILD PEACHES," 33 lbs. in Ohio.

4. Miscellaneous Legal Sizes.

The heap bushel contains 2,564 cubic ins. in Connecticut and Kansas; 2,150.42 ins. in New Jersey, Pennsylvania, Nebraska, Tennessee, Missouri, Washington.

The bushel measure must be 19½ ins. in outside diameter, the half bushel 15½ ins., the peck 12½ ins. in New York and California.

The bushel measure must be 18½ ins. in inside diameter, the half bushel 13¾ ins., the peck 10¾ ins. and the half peck 9 ins., in New Hampshire and Minnesota.

Produce sold by dry measure must be heaped as full as the measure will hold in Ohio, Illinois, Michigan, Wisconsin, Minnesota, California, Oregon and Washington.

Heap measures must be cylindrical, with a plane bottom, in New York and California.

The half-bushel is $13\frac{29}{40}$ ins. in interior diameter and $7\frac{1}{24}$ ins. deep in Ohio. It contains $1{,}075\frac{1}{5}$ cubic ins. in Indiana.

In New Jersey the cranberry box, to hold a bushel, must be 12x8¾x22 ins. in the clear.

In Wisconsin, cranberry packages must conform to the following sizes: "The legal and standard cranberry barrel in this state shall be twenty-three and three-quarter inches high, sixteen and one-fourth inches in diameter at the head, and

Miscellaneous Legal Sizes, continued.

eighteen inches in diameter at the bilge, inside measure. Every manufacturer of barrels for cranberries shall stamp or brand his name with the letters W. S. on such barrels to indicate that they are the Wisconsin Standard in size. All sales of cranberries in packages less than a barrel should be by the bushel or quart, struck or level dry measure. A standard bushel crate for cranberries shall be twenty-two inches long, twelve and one-fourth inches wide by seven and one-half inches deep, inside measure."

In Michigan the quantity known as a box or a basket of peaches shall contain 716⅘ cubic ins. or ⅛ of a bushel, strict measure.

In New York a barrel of apples, quinces, pears or potatoes shall contain 100 quarts of grain or dry measure, except that potatoes, when sold by weight, shall be 172 lbs. to the barrel.

In New York the measure for fruit shall be the half-bushel, which shall be made cylindrical, the diameter outside to outside 15½ ins. The standard half-bushel has $1,075\frac{21}{100}$ cubic ins.

MICHIGAN STANDARD MEASURE.—The half bushel or parts thereof shall be the standard measure for fruits customarily sold by heaped measure; and in measuring said commodities the half bushel or other small measure shall be heaped as high as may be, without special effort or design.

MICHIGAN STANDARD BARREL.—A barrel of fruit, roots, or vegetables is the quantity contained in a barrel made from staves 27 ins. in length, and each head 16½ ins. in diameter, or ordinary flour barrel size.

The standard weight of apples is 48 lbs. to the bushel.

In Tennessee a barrel of apples contains 2½ bushels. A liquid barrel contains 42 gals.

In Wisconsin a barrel of apples shall contain 100 quarts dry measure.

The avoirdupois pound bears to the troy pound the relation of 7,000 to 5,760 in New York, New Jersey, Pennsylvania. Ohio, Iowa, Nebraska, Tennessee and California.

5. Society and Customary Standards.

The standard orange box adopted by the Florida Fruit Exchange measures 12x12x27 inches, with partition in the middle. The Exchange issues the following instructions:

We recommend the following classifications for oranges: Fancy, Choice Bright, Bright Russet, Choice Russet, Russet.

Oranges classed as Fancy should be extra bright, with very smooth, thin skin. Rough, thick-skinned fruit, being ever so bright, should never be classed as fancy.

Oranges classed as choice bright should be strictly bright and fairly smooth skin and of desirable size.

Oranges classed as bright should be bright and free from rust.

Oranges classed as bright russet should be at least *two-thirds bright*, with smooth skin and of desirable size.

Oranges classed as choice russet should be quite smooth skin and of desirable size.

Oranges of a common dark variety should be classed as russets.

Never pack bright and rusty oranges in the same box. Never pack large and small oranges in the same box.

One of the most important features in the packing of oranges is the uniform neatness of the packages. Buyers will pay more for fruit that is neatly and properly packed than they will pay for such as is carelessly put up. A box of oranges neatly packed, strapped and marked, naturally attracts the attention of buyers.

After your fruit has been carefully packed in accordance with above instructions, please mark the boxes as follows:

Place the stencil of the Florida Fruit Exchange on one end of the box in center of head.

In the upper left hand corner of the box-head stencil the quality of orange the box contains—*Fancy*, *Choice Bright*, *Bright*, *Bright Russet*, *Choice Russet*, *Russet*, *Mandarin*, *Tangierine*, *or Navel*, as the case may be.

In the *upper middle* of the box-head stencil the number of oranges the box contains—"128," "176," "200," etc., as the case may be.

Society and Customary Standards, continued.

In the upper *right hand* corner stencil the *letters* according to the following schedule:

All sizes under 128, mark A.
Sizes 128 to 138, mark B.
Sizes 146 to 160, mark C.
Sizes 176 to 200, mark D.
All sizes over 200, mark E.

The Georgia Horticultural Society adopts the one-third bushel oblong crate for peaches and similar fruits. The dimensions of this crate are about 8x12½x22 inches.

CALIFORNIA. SIZES IN COMMON USE FOR LOCAL MARKETS. (*Wickson.*)

APPLE AND PEAR.—Top, bottom and sides of ¼ in. and ends of ⅝ in. stuff. The length is 22 ins.; ends 10 by 12 ins. This is called a 50 lb. box, but it contains less weight.

CHERRY.—15½ ins. in length; ends 8¼ by 3½.

FIG.—The two-layer fig box is 20 ins. long; ends 2 by 3½ ins., and holds about 20 lbs. The single layer is the same length and width, but 2 ins. deep and holds about 12 lbs.

GRAPES.—The same as that used for plums in distant shipment, except that the depth is usually 5 ins. and the contents about 25 lbs. of fruit. Grapes are also shipped in 4-lb. splint baskets, of which 4 go in a half crate or 8 in a whole crate.

MELONS.—Cantaloupe crates 38 ins. long, 16 ins. wide and 15 deep. Watermelons come in bulk in cars or in large cases of all descriptions.

ORANGES.—Flat boxes 22 ins. long, ends 7¾ by 17½ ins. It is divided in two parts by a central partition. The prevailing orange box at present is about 26½ ins. long, ends 11½ ins. square, with a central partition.

SMALL FRUITS.—Chests or crates which contain 10, 15 or 20 drawers. The drawers are 15½ ins. long, ends 8¼ by 1¾ ins. The sizes have been constantly decreasing. The old

Society and Customary Standards, continued.

drawers held 5 lbs. of strawberries; the present weight is about 4 lbs.

PACKAGES FOR DRIED FRUITS.—25 lb box. Inside measurements—length, 13¾ ins.; width, 9¾ ins.; depth, 5¾ ins. Outside measurements—length, 15¼ ins.; width, 10½ ins.: depth, 6½ ins.; top, bottom and sides, ⅜ of an in. thick; ends, ¾ of an inch thick.

A More Flat Package.—Inside measurements—length, 16 ins.; width, 9 ins.; depth, 5 ins. Outside measurements—length, 17¼ ins.; width, 9¾ ins.; depth, 5¾ ins. Top, bottom and sides, ⅜ of an in. thick; ends, ⅝ of an inch thick.

Fifty Pound Box.—Inside measurements—length, 15¼ ins.; width, 9 ins.; depth, 9 ins Outside measurements—length, 17¼ ins.; width, 10 ins.; depth, 10 ins. Top, bottom and sides ½ in. thick; ends, 1 in. thick.

RAISINS.—20 lb. raisin box, 19⅞ in. long, ends 9 by 4¾ ins. Half box, same length and width, depth, 2⅜ ins.; quarter box, same length and width, depth, 1¼ ins.; eighth box, 15½ ins. long, ends 6 by 1¼ inches.

SACKS FOR DRIED FRUIT.—White cotton sacks, made of what is called heavy export goods, are used for shipment of dried fruits. They are 20 by 36 ins. and hold about 80 lbs. of fruit.

CALIFORNIA PACKAGES FOR EASTERN SHIPMENT AS ADOPTED BY THE FRUIT UNION OF THAT STATE.

The ends of all boxes should be made of ¾ in. stuff, and all cleats ⅜ inch stuff. The sides, tops, and bottoms of cherry boxes should be of ¼ in. stuff; the sides made of two strips each of ¼ in. stuff and ⅞ of an in. in width. Peach, pear and plum boxes should be made of $\frac{8}{10}$ in. stuff. All the lumber used should be dressed as smooth as possible.

Cherry boxes, capacity 10 lbs. Outside measurements—18 ins. in length, 10⅞ ins. in width; 3 ins. in depth. Inside measurements—length, 16½ ins.; width, 10⅜ ins; depth, 2½ ins.

Society and Customary Standards, continued.

Plum boxes, capacity 20 lbs. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 4⅜ ins. in depth. Inside measurements—length, 8½ ins.; width, 11¾ ins.; depth, 4 ins.

There are four sizes of peach and apricot boxes:

First, capacity 22 pounds. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 4¾ ins. in depth. Inside measurements—length, 18½ ins.; width, 11¾ ins.; depth, 4⅜ ins.

Second, capacity 25 lbs. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 5¼ ins. in depth. Inside measurements—length, 18½ ins.; width, 11¾ ins.; depth, 4⅞ ins.

Third, capacity 27 lbs. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 5¾ ins. in depth. Inside measurements—length, 18¼ ins.; width, 11¾ ins.; depth, 5⅜ ins.

Fourth, capacity 30 lbs. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 6¼ ins. in depth. Inside measurements—length, 18½ ins.; width, 11¾ ins.; depth, 5⅞ ins.

Pear boxes, capacity 40 lbs. Outside measurements—19¾ ins. in length, 12⅛ ins. in width, 8⅞ ins. in depth. Inside measurements—length, 18½ ins.; width, 11¾ ins.; depth, 8½ ins.

Grading of Prunes.—Prunes are graded by running them over screens of various degrees of coarseness. The meshes should be oblong, 2 ins. or more in length for all the sizes, the widths varying as stated in the table below. The California French prunes are usually sorted in six sizes, by using the following methods:

Grade.	Width of mesh for green prunes.	Width of mesh for dried prunes.
Extras, 40 to 50 to pound	1⅜ inch	1¼ inch.
No. 1, 50 to 60 "	1¼ "	1⅛ "
No. 2, 60 to 70 "	1⅛ "	1 "
No. 3, 70 to 80 "	1 "	⅞ "
No. 4, 80 to 90 "	⅞ "	¾ "
No. 5, 90 to 100 "	¾ "	⅝ "

Society and Customary Standards, continued.

Watermelons are usually sorted into three grades. Of the largest size, about 6 melons are placed in a barrel. Of medium size, about 8 (4 melons in each of 2 layers), and of the smallest size, 10 to 12. A truck load of melons comprises about 200 fair sized fruits. A car load numbers from 1,000 to 1,500.

Cocoa nuts are packed for shipment in bags which hold 100 fruits.

"Ekimis" branded upon boxes of Smyrna figs means A No. 1, or superior selected. "Eleme" means selected, the second grade.

6. Covent Garden (London) Measures.

SEAKALE PUNNETS.—8 ins. diameter at the top, 7½ ins. at the bottom, and 2 ins. deep.

RADISH PUNNETS.—8 ins. diameter and 1 in. deep, if to hold 6 hands; or 9 ins. by 1 in. for 12 hands.

MUSHROOM.—7 ins. by 1 in.

SALAD PUNNETS.—5 ins. by 1 in.

SIEVE.—Contains 7 imperial gals.; diameter 15 ins.; depth, 8 ins. A sieve of peas is equal to 1 bu.; a sieve of currants 12 qts.

HALF-SIEVE.—Contains 3½ imperial gals. It averages 12½ ins. in diameter and 6 ins. in depth.

BUSHEL SIEVE.—10½ imperial gals. Diameter at top 11¾ ins., at bottom 17 ins.; depth, 11¼ ins.

BUSHEL BASKET, ought, when heaped, to contain an imperial bushel. Diameter at bottom 10 ins., at top 14½ ins. depth, 17 ins. Walnuts, nuts, apples and potatoes are sold by this measure. A bus. of the last named, cleansed, weighs 56 lbs., but four pounds additional are allowed if they are not washed. A junk contains ⅔ of a bu.

POTTLE.—A long tapering basket that holds rather over a pt. and a half. A pottle of strawberries should hold ½ a gal., but never holds more than 1 qt.; a pottle of mushrooms should weigh 1 lb.

Covent Garden (London) Measures, continued.

HAND applies to a bunch of radishes, which contains from 12 to 30, or more, according to the season.

BUNDLE contains from 6 to 12 or 20 heads of broccoli, celery, etc; seakale, 12 to 18 heads; rhubarb, 20 to 30 stems, according to size; and of asparagus from 100 to 150.

GRAPES are put up in 2 lbs. and 4 lbs. punnets; new potatoes by the London growers in 2 lbs. punnets. Apples and pears are put up in bu. sieves, or half sieves. A 100 weight of Kentish filberts is 104 lbs. Weights are always 16 ozs. to the lb.

BUNCH.—Radishes, 12 to 24; carrots, 12 and upwards; turnips, 12 and upwards; leeks, 6 and upwards.

A roll of celery contains 6, 8, to 12 heads or roots.

A score of lettuce or endive is 22.

A tally is 5 dozen.

CHAPTER XIV.

Tables of Measures and Weights.

Dry Measure.

2 pints ..... = 1 quart.
8 quarts ..... = 1 peck.
4 pecks ..... = 1 bushel.
8 bushels (480 pounds)..... = 1 quarter.
36 bushels..... = 1 chaldron.

bu.		pk.		qt.		pt.
1	=	4	=	32	=	64
		1	=	8	=	16
				1	=	2

Liquid Measure.

4 gills..... = 1 pint.
2 pints ..... = 1 quart.
4 quarts..... = 1 gallon.
31½ gallons ..... = 1 barrel.
2 barrels or 63 gallons..... = 1 hogshead.

gal.		qt.		pt.		gi.
1	=	4	=	8	=	32
		1	=	2	=	8
				1	=	4

Apothecaries' Fluid Measure.

60 minims..... = 1 fluidram.
8 fluidrams..... = 1 fluidounce.
16 fluidounces ..... = 1 pint.
8 pints ..... = 1 gallon.

Apothecaries' Fluid Measure, continued.

cong.	o.	f.	f.	m.
1 =	8 =	128 =	1,024 =	61,440
	1 =	16 =	128 =	7,680
		1 =	8 =	480
			1 =	60

One minim equals 1 drop of water.

Line, or Linear Measure.

12 inches ..... = 1 foot.
3 feet ..... = 1 yard.
5½ yards, or 16½ feet ..... = 1 rod, or pole.
40 rods ..... = 1 furlong.
8 furlongs (320 rods) ..... = 1 mile (statute mile).
3 miles ..... = 1 league.

l.	m.	fur.	rd.	yd.	ft.	in.
1 =	3 =	24 =	960 =	5,280 =	15,840 =	190,080
	1 =	8 =	320 =	1,760 =	5,280 =	63,360
		1 =	40 =	220 =	660 =	7,920
			1 =	5½ =	16½ =	198
				1 =	3 =	36
					1 =	12

Surveyor's, or Chain Measure.

7.92 inches ..... = 1 link.
25 links ..... = 1 rod, or pole.
4 rods, or 66 feet ..... = 1 chain.
80 chains ..... = 1 mile.

mi.	ch.	rd.	l.	in.
1 =	80 =	320 =	8,000 =	63,360
	1 =	4 =	100 =	792
		1 =	25 =	198
			1 =	7.92

Square or Surface Measure.

144 square inches ..... = 1 square foot.
9 square feet ..... = 1 square yard.
30¼ square yards ..... = 1 sq. rod or perch.
160 square rods ..... = 1 acre.
640 acres ..... = 1 sq. mile or section.

Square or Surface Measure, continued.

sq. m. a.	sq. rd.	sq. yd.	sq. ft.	sq. in.
1 = 640 =	102,400 =	3,097,600 =	27,878,100 =	4,014,489,600
1 =	160 =	4,840 =	43,660 =	6,272,640
1 =		30¼ =	272¼ =	39,204
		1 =	9 =	1,296
			1 =	144

Surveyors' Square Measure.

625 square links ..... = 1 square rod, or pole
16 poles ..... = 1 square chain.
10 square chains ..... = 1 acre.
640 acres ..... = 1 square mile or sec
36 square miles (6 miles sq.). = 1 township

tp.	sq. mi.	a.	sq. ch	sq. rd.	sq. l.
1 =	36 =	23,040 =	230,400 =	3,986,400 =	2,304,000,000

Solid or Cubic Measure.

1728 cubic inches ..... = 1 cubic foot.
27 cubic feet ..... = 1 cubic yard.
16 cubic feet ..... = 1 cord foot.
8 cord feet, or 128 cubic feet .. = 1 cord of wood.
24¾ cubic feet ..... = 1 perch.

cu. yd.	cu. ft.	cu. in.	cd.	cd. ft.	cu. ft.	cu. in.
1 =	27 =	46,656 =	1 =	8 =	128 =	221,184

Avoirdupois, or Commercial Weight.

27 11/32 grains ..... = 1 dram.
16 drams ..... = 1 ounce.
16 ounces ..... = 1 pound.
25 pounds ..... = 1 quarter.
4 quarter, or 100 pounds ..... = 1 hundredweight.
20 hundredweight, or 2,000 lbs . = 1 ton.
480 pounds ..... = imperial quarter.
100 pounds is also called ..... 1 central.

t.	cwt.	lb.	oz.	dr.	gr.
1 =	20 =	2,000 =	32,000 =	512,000	
	1 =	100 =	1,600 =	25,600	
		1 =	16 =	256 =	7,000
			1 =	16	

Troy, or Jewelers' Weight.

24 grains ..... = 1 pennyweight.
20 pennyweights ..... = 1 ounce.
12 ounces ..... = 1 pound.

lb.		oz.		pwt.		gr.
1	=	12	=	240	=	5,760
		1	=	20	=	480
				1	=	24

Apothecaries' Weight.

20 grains ..... = 1 scruple.
3 scruples ..... = 1 dram.
8 drams ..... = 1 ounce.
12 ounces ..... = 1 pound.

lb.		oz.		dr.		scr.		gr.
1	=	12	=	96	=	288	=	5,760
		1	=	8	=	24	=	480
				1	=	3	=	60
						1	=	20

Table of Comparative Weights.

Avoirdupois.	Troy.	Apothecaries.
700 gr. = 1 lb	5,760 gr. = 1 lb.	5,760 gr. = 1 lb.
1 lb. =	1 $\frac{31}{144}$ lbs. =	1 $\frac{31}{144}$ lbs.
or 144 lbs. =	175 lbs. =	175 lbs.
1 oz. =	$\frac{175}{192}$ oz. =	$\frac{175}{192}$ oz.
or 192 oz. =	175 oz. =	175 oz.

Miscellaneous Table.

$\frac{1}{12}$ of an inch ..... = a line (American).
$\frac{1}{10}$ of an inch ..... = a line (French).
3 inches ..... = a palm.
4 inches ..... = a hand.
9 inches ..... = a span.
18 inches ..... = a cubit.
2½ feet ..... = a military pace.
3 feet ..... = a pace.
A wine gallon ..... = 231 cubic inches.
A dry gallon ..... = 268.8 "

Miscellaneous Table, continued.

An imperial gallon	=	277.274 cubic inches.
A U. S. bushel	=	2,150.42 "
A U. S. bushel heaped	=	2,688 "
An English bushel	=	2,218.192 "

1 pint of water weighs 1.0431 lbs.
1 gallon of water weighs 8.3450 lbs.
1 cubic foot of water weighs 62.425 lbs. at 39.2° F.

An English (statute) mile is	1,760 yards.
A Scotch mile is	1,984 "
An Irish mile is.....	2,240 "
A Dutch mile is	8,101 "
A Roman mile is	1,628 "
A German mile is	6,859 "
A Russian mile is	1,100 "
An Arabian mile is	2,148 "
A sea (nautical) mile is	2,026 "

Equivalents of Metric Measures of Capacity.

Metric denominations		Dry measure.		Liquid measure	
1 millimeter ...	=	.001816 pts.	=	.0338	fl. oz.
1 centiliter	=	.01816 pts.	=	.338	fl. oz.
1 deciliter	=	.181625 pts.	=	.84532	gi.
1 liter	=	.908128 qts.	=	1.056745	qts.
1 dekaliter	=	9.08128 qts.	=	2.64186	gals.
1 hectoliter....	=	2.8379 bus.	=	26.4186	gals.
1 kiloliter	=	28.379 bus.	=	264.186	gals.
1 myrialiter ...	=	283.79 bus.	=	2641.86	gals.

Equivalents of Metric Linear Measure.

		Equivalents in English measure.
1 millimeter	=	.05937 inches.
1 centimeter	=	.3937 "
1 decimeter.....	=	3.93707 "
1 meter	=	39.37079 "
1 dekameter.....	=	32.80899 ft.
1 hectometer	=	19.88423 rods.

Equivalents of Metric Linear Measure, continued.

1 kilometer	=	.62138 mile.
1 myriameter	=	6.21382 miles.

Equivalents of Metric Square Measure.

1 sq. centimer	=	.155 sq. in.
1 sq. decimeter	=	15.5 sq. in.
1 sq. meter	=	1.19603 sq. yds.
1 sq. dekameter	=	119.6034 sq. yds.
1 sq. hectometer	=	2.47114 sq. rds.
1 sq. kilometer	=	.3861 sq. miles.

Equivalents of Metric Cubic Measure.

1 cu. centimeter	=	.061027 cu. in.
1 cu. decimeter	=	61.02705 cu. in.
1 cu. meter, or stere	=	35.31658 cu. ft.

Equivalents of Metric Weights.

1 miligram	=	.015432 gr. troy.
1 decigram	=	1.54324 gr. troy.
1 centigram	=	.15432 gr. troy.
1 gram	=	15.43248 gr. troy.
1 dekagram	=	.35273 oz. avoir.
1 hectogram	=	3.52739 oz. avoir.
1 kilogram	=	2.20462 lbs. avoir
1 myriagram	=	22.04621 lbs. avoir.
1 quintal	=	220.46212 lbs. avoir.
1 tonneau or ton	=	2204.62124 lbs. avoir., or 1.10281 tons.

CHAPTER XV.

Miscellaneous Tables, Figures and Notes.

1. Quantity of Water Held by Pipes of Various Sizes.

Diameter of Bore.	*Contents of 100 Feet in Length.*
½ in	.84 gals.
1 "	3.39 "
1½ "	7.64 "
2 "	13.58 "
2½ "	21.22 "
3 "	30.56 "
4 "	54.33 "
5 "	84.90 "
6 "	122.26 "

2. Number of Gallons in Circular Tanks and Wells.

To find the contents in gallons of circular tanks, etc., square the diameter in feet, multiply by the depth and then multiply by 4.8947.

Diameter.	GALLONS WHEN THE DEPTH IS									
	3 ft.	*4 ft.*	*5 ft.*	*6 ft.*	*7 ft.*	*8 ft.*	*9 ft.*	*10 ft.*	*11 ft.*	*12 ft.*
4 ft.	235	313	391	469	548	626	704	783	861	989
5 "	367	489	611	734	856	979	1101	1223	1346	1468
6 "	528	704	881	1057	1233	1409	1585	1764	1988	2114
7 "	719	959	1199	1439	1678	1918	2158	2398	2638	2878
8 "	939	1253	1566	1879	2194	2506	2819	3182	3445	3759
9 "	1189	1585	1982	2378	2775	3171	3568	3964	4361	4757
10 "	1468	1957	2447	2936	3426	3915	4405	4894	5884	5873
11 "	1776	2368	2961	3553	4145	4787	5330	5922	6514	7107
12 "	2114	2812	3524	4229	4933	5638	6343	7048	7753	8458

3. Number of Gallons in Square-Built Tanks.

To find the number of gallons in any square or oblong vessel multiply the number of cubic feet contained in it by 6.232.

Size of Tank.	*3 ft. deep.*	*4 ft. deep.*	*5 ft. deep.*
6 by 3 feet	336	448	560
6 " 4 "	448	598	747
6 " 5 "	560	747	934
6 " 6 "	673	897	1121
7 " 4 "	523	698	870
7 " 5 "	654	872	1090
7 " 6 "	785	1047	1308
7 " 7 "	916	1221	1526
8 " 4 "	598	797	997
8 " 5 "	747	997	1246
8 " 6 "	897	1196	1495
8 " 7 "	1046	1395	1744
8 " 8 "	1196	1595	1994
9 " 5 "	841	1121	1402
9 " 6 "	1009	1346	1682
9 " 7 "	1177	1570	1963
9 " 8 "	1346	1784	2243
9 " 9 "	1514	2019	2523
10 " 5 "	934	1246	1558
10 " 6 "	1121	1495	1869
10 " 7 "	1308	1744	2181
10 " 8 "	1495	1994	2492
10 " 9 "	1682	2243	2804
10 " 10 "	1869	2492	3116
11 " 6 "	1233	1645	2056
11 " 7 "	1439	1919	2899
11 " 8 "	1645	2193	2742
11 " 9 "	1850	2467	3084
11 " 10 "	2056	2742	3427
11 " 11 "	2262	3016	3770
12 " 6 "	1346	1794	2243
12 " 7 "	1570	2093	2617
12 " 8 "	1794	2393	2901
12 " 9 "	2019	2892	3365
12 " 10 "	2243	2991	3739
12 " 11 "	2467	3290	4113
12 " 12 "	2692	3589	4487

4. Thermometer Scales.

Fahrenheit.—The freezing point is taken as the 32d degree of the scale, and 180 degrees are made between that and the boiling point, which therefore becomes 212°.

Centigrade or Celsius.—The freezing point of water is taken as the zero, and boiling point as 100°.

Reaumur.—The freezing point of water is taken as zero, and the boiling point as 80°.

A degree Centigrade is therefore greater than a degree of Fahrenheit as nine is greater than five; and a degree of Reaumur is greater than nine is greater than four.

To reduce Fahrenheit degrees to Centigrade, subtract 32 from the given degree of Fahrenheit and multiply the remainder by 5 and divide it by 9: (F.°—32) $\frac{5}{9}$.

To reduce Centigrade to Fahrenheit, multiply the given degree of Centigrade by 9 and divide the product by 5, then to the quotient add 32: ($\frac{9}{5}$ C.° + 32).

To reduce Fahrenheit to Reaumur, subtract 32 from the given degree of Fahrenheit and multiply the remainder by 4 and divide by 9: (F.°—32) $\frac{4}{9}$.

To reduce Reamur to Fahrenheit, multiply the given degree of Reamur by 9 and divide by 4, then add 32: ($\frac{9}{4}$ R.° + 32.)

5. Effects of Wind in Cooling Glass.

(*Leuchars.*)

3.26	miles	2:58	minutes.
5.18	"	2:16	"
6.54	"	1:91	"
8.86	"	1:66	"
10.90	"	1:50	"
13.36	"	1.25	"
17.97	"	1:08	"
20.45	"	1:00	"
24.54	"	:91	"
27.27	"	:81	"

6. Per Cent. of Rays of Light Reflected from Glass Roofs at Various Angles of Inclination.

(*Bouguer.*)

1°	2.5 per cent.
10°	2.5 "
20°	2.5 "
30°	2.7 "
40°	3.4 "
50°	5.7 "
60°	11.2 "
70°	22.2 "
80°	41.2 "
85°	54.3 "

7. Area of Glass in Various States and Provinces, used for Commercial Greenhouse Purposes.

(*Stewart.*)

	Glass in use previous to 1887.	INCREASE IN 1887		
		For cut-flowers.	*For plants.*	*Total increase.*
Alabama	50,000	3,000	6,780	9,780
Arkansas	14,474	8,188	4,150	12,338
California	213,660	59,810	32,200	92,010
Connecticut		35,071	17,551	52,622
Delaware	79,100		3,000	3,000
District of Columbia.	125,000	37,100	4,000	41,000
Florida	20,000	20,000	10,000	30,000
Georgia	33,100	2,400	500	2,900
Illinois	1,422,533	12,676	36,824	99,500
Indiana	142,866	20,575	23,240	43,815
Iowa	125,580	27,900	13,110	41,010
Kansas	31,600	1,800	2,250	4,050
Kentucky	320,400			
Louisiana	24,420	11,400	7,600	19,000
Maine	102,033	19,130	4,000	23,130
Maryland	185,526	29,908		29,908
Massachusetts	1,375,000	53,000		53,000

Area of Glass for Commercial Greenhouse Purposes, continued.

	Glass in use previous to 1887.	INCREASE IN 1887		
		For cut-flowers.	*For plants.*	*Total increase.*
Minnesota	138,500	22,600	5,600	28,200
New Hampshire	86,450	11,825	3,275	15,100
New Jersey	2,114,245	297,529	59,504	357,033
New York	1,412,500	60,700	19,250	79,950
North Carolina	15,400	1,500	4,500	6,000
Ohio	1,378,929	67,000	50,230	117,230
Pennsylvania	1,315,240	183,050	83,576	266,626
Rhode Island	93,771	13,918	1,000	14,918
South Carolina	3,300	3,825	.....	3,825
Tennessee	62,200	9,636	6,500	16,136
Texas	18,600	3,800	5,980	9,780
Vermont	37,950	7,700	7,200	14,900
Virginia	53,868	15,240	5,200	10,040
West Virginia	19,800	.....	.....	.....
Wisconsin	148,230	24,806	3,127	27,933
Ontario	176,498	.....	.....	61,500
Quebec	103,696	12,790	8,577	21,367

8. National and Party Flowers.

Canada ..... Sugar Maple.
China ..... Narcissus.
Egypt ..... Lotus (*Nymphæa Lotus*).
England ..... Rose.
France ..... Fleur-de-lis (*Iris*).
Germany ..... Corn-flower (*Centaurea Cyanus.*)
Greece (*Athens*) .... Violet.
Ireland ..... Shamrock (*Trifolium*, usually *T. repens*).
Italy ..... Lily.
Japan ..... Chrysanthemum.
Prussia ..... Linden.
Saxony ..... Mignonette.

National and Party Flowers, continued.

Scotland	Thistle.
Spain	Pomegranate.
Wales	Leek.

Beaconfield's followers	Primrose.
Bonapartists	Violet.
Ghibellines	White lily.
Guelphs	Red lily.
Prince of Orange	The orange

9. Dates at which Various Fruits and Nuts Appear in Northern Markets.

(*From New England Grocer.*)

NUTS.—Peanuts, about the first of November.

Walnuts, French, Naples and Grenoble, about the middle of November.

Pecans, about the same time as walnuts.

Filberts, about the first of November.

Castanas, early in March.

Almonds, shelled about October first, and Ivica and Princess about forty-five days later.

Shellbarks, October first.

Baracoa cocoanuts begin to come during the latter part of March and the first of April.

Chestnuts, late in September.

DRIED FRUITS.—Citron (Leghorn), October first.

Currants, the middle of October.

Dates, Fard about the middle of November, and Persian about December 12.

Prunes, French, about the middle of October, and Turkish a month or so later.

Raisins, Malaga fruit, which includes loose Muscatels, 2, 3, 4 and 6 crown; and Imperial Cabinet layers, B. B., Empire Cluster, Royal and Imperial begin to put in appearance about

Dates Fruits and Nuts Appear in Northern Markets, continued.

the first of November. California raisins begin to come early in October. Sultana raisins are due about October first, and New Valencias about the same time.

FOREIGN GREEN FRUIT.—Oranges, Messina, Valencia and Palermo, and all Mediterranean fruit early in December.

Florida oranges generally begin to arrive the first of November. Jamaicas get here the middle of September.

Lemons, Messina, Valencia and Palermo and all Mediterranean fruit December first.

Aspinwall, Cuban, Jamaica and Baracoa bananas come the year round, every month in the year, and about every day in the month a portion of the time—certainly every week in each month.

Pineapples, mostly Havanas, come whenever there is a demand for them, the year round, Florida pines come during the latter part of May and the first of June.

Grapes. Malagas, are due about October first.

New figs begin to come along about the same time.

DOMESTIC GREEN FRUIT.—Apples, new, early in August. Russetts generally make their appearance upon the market early in the winter, and Gravensteins in December.

Pears, September.

Peaches, Jersey, latter part of August and early in September. Delawares early in August.

Plums. All along from August first to the middle of November.

Grapes. Hamburgs are in the market about all the year round, save, perhaps, three or four months. Catawbas arrive about the middle of August, and ives about the same time.

Berries. Blueberries, usually in July. Blackberries are liable to arrive any time in June.

Watermelons are with us from the first of June to the first of September.

Cantaloupes. Early in July, lasting about three months.

10. What Constitutes Wholesale Quantities.

The wholesale fruit dealers of Washington, D. C., have adopted the following rules to govern the least quantities of fruits to be sold at wholesale rates:

BANANAS.—Not less than one bunch.

APPLES.—Not less than one barrel or box as received; no packages to be broken.

PINEAPPLES.—Not less than twenty-five.

ORANGES.—Not less than one box; no packages to be broken

LEMONS.—Not less than one box; no packages to be broken.

GRAPES OF ALL KINDS.—Not less than five baskets.

MALAGA GRAPES.—By the keg only.

PEACHES.—Not less than one box or one bushel crate, or not less than five baskets; no packages to be broken. If in half-bushel lots, not less than two.

PEARS.—One box or barrel; if in baskets not less than five

WATERMELONS.—Not less than twenty-five.

MUSKMELONS.—Not less than twenty-five.

STRAWBERRIES AND ALL OTHER BERRIES.—Not less than a thirty-two quart crate, unless small quantity received. A sixty-quart crate may be halved. An exception made with raspberries; not less than fifteen quarts. In February and March, strawberries, not less than fifteen quarts.

11. Average Prices in France of Various Orchid Flowers.

(*Orchidophile*).

From 20 to 25 centimes*: *Dendrobium nobile, Wardii.*

30 centimes: *Cypripedium insigne, Masdevallia Lindeni Harryana, ignea, Veitchii, Odontoglossum Pescatorei, Rossi.*

From 30 to 60 centimes: *Odontoglossum crispum (Alexandræ), triumphans, luteo-purpureum, Schlieperianum, Insleayi Cattleya amethystina, Skinneri.*

From 60 to 75 centimes: *Cypripedium villosum, Harrisianum Spicerianum, Boxalli.*

From 1 franc to 1 franc and 25 centimes: *Odontoglossum*

*A centime is about one-fifth of a cent, and a franc is about 20 cents.

Average Prices of Various Orchid Flowers, continued.

grande, *Lycaste Skinneri* (price sometimes as low as 50 centimes), *Cœlogyne cristata* (per truss), *Cattleya labiata*, *Mossiæ*, *Percivaliana*, *Gaskeliana*, *Perrini*, *Pinelli*, *elegans*, *Trianæ*.

From 1 franc and 50 centimes to 2 francs: Various *Vandas*, *Cattleya Domiana*.

Trusses of *Ærides* and *Saccolabium* sell from a franc and a half to 3 francs, or even for 5 francs for extra good specimens.

12. Weights of Various Varieties of Apples per Bushel.

The following varieties, just from the trees in October, gave the following weights:

	Pounds.		Pounds.
Baldwin	50	Pennock	47
Belmont	50	Rambo	50
Ben Davis	47	Rhode Island Greening	52
Bunker Hill	49	Roxbury Russet	50
Cabashae	57	Rubicon	46
Esopus Spitzenburg	44	Stark	56
Fallawater	48	Swaar	51
Golden Russet	53	Sweet Bough	39
Lawver	47	Talman Sweet	48
Nickajack	51	Tompkins King	44
Northern Spy	46	Yellow Bellefleur	46

13. Various Recipes and Rules.

Black ink for zinc labels.—Verdigris, 1 ounce; salammoniac, 1 ounce; lamp black, ½ ounce; rain water, ½ pint. Mix in an earthenware mortar or jar and put up in small bottles. To be shaken before use and used with a clean quill pen on bright zinc.

To prevent boilers from filling with sediment or scale.—1. Exercise care to get clean water and that which contains little lime. 2. Blow it out often. It can be blown out a little every day, and occasionally it should be blown off entirely. 3. Put slippery elm bark in the boiler tank. Or, if slippery elm is not handy, use potato peelings, flax seed, oak bark, spent tan

Various Recipes and Rules, continued.

or coarse saw-dust. 4. Put in with the feed water or otherwise, a small quantity of good molasses (not a chemical syrup), say ½ pt. to 1 pt. in a week, depending upon size of the boiler. This will remove and prevent incrustation without damage to the boiler. These vegetable substances prevent, in a measure, by mechanical means, the union of the particles of lime into incrustations.

Cutting glass bottles.—1. Pass 5 or 6 strands of coarse packing twine round the bottle on each side of where you want it divided, so as to form a groove ⅛ inch wide; in this groove pass one turn of a piece of hard-laid white line, and extend the two ends; fasten to some support. Saw the bottle backwards and forwards for a short time; after a minute's friction, by a side motion of the bottle, throw it out of the line in a tub of water, and then tap the side of the tub and the bottom will fall off.

2. Fill the bottle the exact height you wish it to be cut, with oil of any kind; dip, very gradually, a red-hot iron into the oil. The glass suddenly chips and cracks all round, then the upper surface may be lifted off at the surface of the oil.

3. For cutting bottoms of bottles off make a slight nick with a file, and then mark round with a streak of ink where you want it to come off. Make an iron red-hot and lay it on the nick. This will cause it to expand and crack, then by moving the rod round, the crack will follow.

To preserve wooden labels.—Thoroughly soak the pieces of wood in a strong solution of copperas (sulphate of iron); then lay them, after they are dry, in lime water. This causes the formation of sulphate of lime, a very insoluble salt, in the wood

To prepare paper for hot-bed sash.—Use a sash without bars, and stretch wires or strings across it to secure as a rest for the paper. Procure stout but thin manilla wrapping paper and paste it firmly on the sash with fresh flour paste. Dry in a warm place and then wipe the paper with a damp sponge to

Various Recipes and Rules, continued.

cause it to stretch evenly. Dry again, and then apply boiled linseed oil to both sides of the paper, and dry again in a warm place.

Cowdung is highly prized by many gardeners for use in potting soil. It is stored under cover and allowed to remain until dry, being turned several times in the meantime to pulverize it. Manure water is made either from this dried excrement, or from the fresh material. When made from the fresh material, the manure water should be made weaker than in the other case.

To find the bushels of shelled corn in a crib or bin of corn in the ear, divide the cubic contents by 2.

To find the number of bushels of potatoes, apples, etc., in a bin, multiply the cubic contents by 8 and point off one figure in the product.

To find the tons of hay in a mow or stack, divide the cubic contents by about 510, if the hay is not well settled, or by about 460 if the hay is well packed.

Approximate value of household measures.—

1 teaspoonful equals 1 dram.
1 dessertspoonful equals 2 teaspoonfuls, or 2 drams.
1 tablespoonful equals 2 dessertspoonfuls, or 4 teaspoonfuls.
2 tablespoonfuls equals 8 teaspoonfuls, or 1 ounce.
1 common size wineglassful equals 2 ounces, or ½ gill.
A tea cup is estimated to hold 4 fluid ounces, or 1 gill.
1 pound of wheat is equal to about 1 quart.
1 pound and 2 ounces of Indian meal is equal to 1 quart.
1 pound of soft butter is equal to about 1 pint.
1 pound of sugar is equal to about 1 pint.

14. Various Figures.

From 7 to 12 bushel of apples are required for a barrel of cider.

A bushel of average apples gives from 6 to 7 pounds of evaporated product.

Various Figures, continued.

PRODUCT OF DRIED RASPBERRIES (Professor Green).—

Ohio	9	lbs. to the bushel.
Gregg	8½	" "
Hilborn	8½	" "
Ada	8½	" "
Tyler	8½	" "
Shaffer	8	" "

Raspberries contain from 1½ to 3 lbs. of seeds to the bushel.

A pint of garden blackberries weighs about one pound.

Good clusters of American grapes weigh on an average from one-half to three-fourth pounds, while extra good clusters will reach a pound and a half. Clusters have been reported which weighed two pounds.

A bushel of sweet-corn ears, "in the milk," with the husks which come from it, weighs from 50 to 70 lbs.

There are about 5,000 honey bees in a pound.

SAMPLES OF DATES ON THE TITLE PAGES OF OLD BOOKS.

IↃ ..... is.. 500
McccclxjIj ..... is..1463
McccclLxxz 1472
Mcccc7z 1472
Mcccc. II 472
Mccccxxc 1480
MCCCCIIIjXXVIII 1488
Miiiic iiii x Vlij 1488
MCD XCV 1495
M. VD 1495
MiiijD 1496
MjjjD 1497
MIII.D 1497
MCCCCXCviii 1498
MID 1499
McDXciX 1499
McccclD 1499
MCCCCXCViiij 1499
MCDXCIX 1499
M cccc iCi 1500
MD 1500
MCDCII 1502
M.DXLIX 1549
MIↃL or MDL 1550
M.D.VIL 1554
∞ DLXVI 1566
∞ DLXX 1570
CIↃIↃL xxvi 1576
cIↃIↃLXXX 1580
CIↃIↃXXC 1580
CIↃIↃXXCI 1581
∞ DXXCII 1582
MCCCCCLXXXIII ... 1583
cic IↃ xxcvI 1586
∞ D XXCIIX 1588
ↃICIↃ XX CIIX 1588
Mdxc 1590
CIↃIↃCC 1700
CIↃIↃCCL.CIↃDCCL.. 1750
CIↃ.IↃCCIXCI 1791
CIↃIↃCCC 1800
MDCCC 1800
cIc.IↃccc 1800

CHAPTER XVI.

RULES.

1. Loudon's Rules of Horticulture.

1. Perform every operation in the proper season and in the best manner.

2. Complete every operation consecutively.

3. Never, if possible, perform one operation in such a manner as to render another necessary.

4. When called off from any operation, leave your work and tools in an orderly manner.

5. In leaving off work, make a temporary finish, and clean your tools and carry them to the tool-house.

6. Never do that in the garden or hothouses, which can be equally well done in the reserve ground or in the back sheds.

7. Never pass a weed or an insect without pulling it up or taking it off, unless time forbid.

8. In gathering a crop, take away the useless as well as the useful parts.

9. Let no plant ripen seeds, unless they are wanted for some purpose, useful or ornamental, and remove all parts which are in a state of decay.

2. Rules of Nomenclature.

I. RULES FOR NAMING FRUITS,

Adopted by the American Pomological Society.

1. The originator or introducer (in the order named) has the prior right to bestow a name upon a new or unnamed fruit.

2. The Society reserves the right, in case of long, inappropriate, or otherwise objectionable names, to shorten, modify-

Rules of Nomenclature, continued.

or wholly change the same, when they shall occur in its discussions or reports; and also to recommend such names for general adoption.

3. The names of fruit should, preferably, express, as far as practicable by a single word, the characteristics of the variety, the name of the originator, or the place of its origin. Under no ordinary circumstances should more than a single word be employed.

4. Should the question of priority arise between different names for the same variety of fruit, other circumstances being equal, the name first publicly bestowed will be given preference.

2. RULES FOR NAMING KITCHEN GARDEN VEGETABLES,

As adopted by the committee on nomenclature of the Association of American Agricultural Colleges and Experiment Stations:

1. The name of a variety shall consist of a single word, or at most, of two words. A phrase, descriptive or otherwise, is never allowable; as *Pride of Italy*, *King of Mammoths*, *Earliest of All*.

2. The name should not be superlative or bombastic. In particular, such epithets as *New*, *Large*, *Giant*, *Fine*, *Selected*, *Improved*, and the like, should be omitted. If the grower or dealer has a superior stock of a variety, the fact should be stated in the description immediately after the name, rather than as a part of the name itself; as, "*Trophy*, selected stock."

3. If a grower or dealer has secured a new select strain of a well known variety it shall be legitimate for him to use his own name in connection with the established name of the variety; as *Smith's Winnigstadt*, *Jones's Cardinal*.

4. When personal names are given to varieties, titles should be omitted; as, *Major*, *General*, etc.

5. The term *hybrid* should not be used except in those rare instances in which the variety is known to be of hybrid origin.

6. The originator has the prior right to name the variety;

Rules of Nomenclature, continued.

but the oldest name which conforms to these rules should be adopted.

7. This committee reserve the right, in its own publications, to revise objectionable names in conformity with these rules.

3. WORK OF THE SOCIETY OF AMERICAN FLORISTS.

This society adopted a resolution demanding reform in names of ornamental plants at the meeting of 1888, and a committee was appointed. Definite reform has not yet been inaugurated, however.

3. Rules for Exhibition.

1. AMERICAN POMOLOGICAL SOCIETY RULES.

For Exhibitors.

1. A plate of fruit must contain six specimens, no more, no less, except in the case of single varieties not included in collections.

2. To insure examination by the proper committees, all fruits must be correctly and distinctly labeled, and placed upon the tables during the first day of the exhibition.

3. The duplication of varieties in a collection will not be permitted.

4. In all cases of fruits intended to be examined and reported by committees, the name of the exhibitor, together with a complete list of the varieties exhibited by him, must be delivered to the secretary of the society on or before the first day of the exhibition.

5. The exhibitor will receive from the secretary an entry card which must be placed with the exhibit, when arranged for exhibition, for the guidance of committees.

6. All articles placed upon the tables for exhibition must remain in charge of the society till the close of the exhibition, to be removed sooner only upon express permission of the person or persons in charge.

7. Fruits or other articles intended for testing, or to be

Rules for Exhibition, continued.

given away to visitors, spectators, or others will be assigned a separate hall, room or tent, in which they may be dispensed at the pleasure of the exhibitor, who will not, however, be permitted to sell and deliver articles therein, nor to call attention to them in a boisterous or disorderly manner.

For the Guidance of Examining and Awarding Committees.

1. In estimating the comparative values of collections of fruits, committees are instructed to base such estimates strictly upon the varieties in such collections which shall have been correctly named by the exhibitor, prior to action thereon by the committee on nomenclature.

2. In instituting such comparison of values, committees are instructed to consider: 1st, the values of the varieties for the purposes to which they may be adapted; 2d, the color, size, and evenness of the specimens; 3rd, their freedom from the marks of insects and other blemishes; 4th, the apparent carefulness in handling, and the taste displayed in the arrangement of the exhibit.

2. MASSACHUSETTS HORTICULTURAL SOCIETY RULES.

Special Rules of the Fruit Committee.—1. All collections and single dishes of fruit offered for prizes at any exhibition *must have marked upon the cards the numbers of the prizes for which they are offered.*

2. All fruits offered for premiums must be correctly named. Indefinite appellations, such as "Pippin," "Sweeting," "Greening," etc., will not be considered as names.

3. All fruits offered for premiums must be composed of exactly the number of specimens or quantity named in the Schedule. A "dish" of apples, pears, peaches, plums, nectarines, quinces, figs, apricots, etc., is understood to contain twelve specimens, and this number will be required of all fruits when not otherwise specified.

4. The whole quantity required of any one variety of fruit must be shown in a single dish or basket.

Rules for Exhibition (Mass. Hort. Society), continued.

5. Contributors of fruits for exhibitions or prizes must present the same in the Society's dishes. All small fruits must be shown in baskets, not more than an inch and three-quarters in depth, which will be furnished to exhibitors by the superintendent, at cost. Market baskets will not be allowed on the tables.

6. No person can compete for more than one prize with the same variety or varieties of fruit; except that a single dish may be of the same variety—but not the same specimens—as one of a collection; and also that the same variety—but not the same specimens—may compete for both special and regular prizes.

7. Grapes grown on girdled vines cannot compete for a premium.

8. All fruits offered for prizes [exceptions noted], and those for foreign grapes must be of out-door culture.

The Fruit Committee, in making their awards, will consider the flavor, beauty, and size of the specimens, comparing each of these properties with a fair standard of the variety. The adaptation of the variety to general cultivation will also be taken into account. Other things being equal, specimens most nearly in perfection as regards ripeness will have the preference.

Special Rules of the Vegetable Committee. — 1. The specimens offered must be well grown, and placed on the tables clean, correctly labeled, and fully complying with the Rules and Regulations of the Society.

2. Special gratuities will be awarded for well-grown varieties from under glass, previous to the opening exhibition.

3. All vegetables offered for premiums must be composed of exactly the number of specimens or quantity named in the schedule.

4. All vegetables offered for premiums at any exhibition *must have marked upon the cards the numbers of the prizes for which they are offered.*

Rules for Exhibition, continued.

5. Prizes will not be awarded when the articles are judged unworthy.

6. Non-compliance with the rules will cause the rejection of the articles offered for premium.

Special Rules of the Flower Committee. — 1. All named varieties of plants or flowers exhibited for premiums must have the name *legibly* and correctly written on stiff card, wood, or some other permanent substance; and each separate plant or flower must have its name attached.

2. All plants, flowers, bouquets, designs, etc., offered for prizes at any exhibition, *must have marked upon the cards the numbers of the prizes for which they are offered.*

3. Plants in pots to be entitled to prizes, must evince skilful culture in the profusion of bloom, and the beauty, symmetry, and vigor of the specimens.

4. All exhibitors not strictly complying with the above rules will be excluded from competition for premiums.

5. No gratuities will be awarded on other than regular prize days, except for objects of special merit.

3. MICHIGAN HORTICULTURAL SOCIETY RULES.

For Exhibitors.—Entries may be made for exhibition, without competition; and if worthy, the Awarding Committee are expected to properly notice them in their reports.

No article entered for competition in one class will be permitted to compete for a premium in any other, except as hereinafter expressly provided.

Each entry of collection of fruits must be accompanied by a correct list of the varieties of each class of fruits, named in the order of their maturity as nearly as may be. No premiums will be awarded in the absence of such list.

Fruits will be valued by committees according to their adaptation to the requirements under which they are entered. A really superior dessert fruit, if entered in a market collection, can only receive credit for its value for the market, as given in

Rules for Exhibition (Mich. Hort. Society), continued.

the Society's catalogue; and vice versa, market varieties found in a dessert or family collection must be adjudged by their proper value for family purposes.

A plate of fruit, unless otherwise specified, must contain five specimens—no more—no less. Of those usually designated "small fruits," the exhibit must be one pint of each variety. Of crab apples and plums, one dozen of each variety. Of dried fruits, one quart of each separate variety or article. Jellies, canned, pickled and preserved fruits, may be entered and shown in glass vessels, of such character and capacity as are commonly employed for family or market purposes.

Flowers, plants, evergreens, and such other articles as the fancy of the exhibitor may suggest, may be freely employed in the ornamentation of exhibits, in any manner that shall not essentially interfere with the examinations of committees, or the general designs of decoration; and full weight will be given to such ornamentation by the awarding committees in rendering their awards.

The entry card, furnished by the secretary, specifying the class and number of the entry, must in all cases be placed in connection with the articles to which it appertains, as a guide to committees.

Articles when entered, named and arranged for exhibition will thenceforth be strictly under the control of the officers in charge of the exhibition, and neither exhibitors or spectators will be permitted to handle them, except by permission of the proper officer.

Any exhibitor, having been awarded a premium upon an article, and removing the same prior to the close of the exhibition, without permission of the officer in charge, will by so doing forfeit his right to such premium.

The name of the fruit should, in no case, appear on the entry card, except only in the case of single plates, or other single articles.

Entry cards, name cards, and the cards of the committee on

Rules for Exhibition, continued.

nomenclature, should, for the convenience of awarding committees and other officers, be each of a different color, or otherwise printed in different colored inks.

Exhibitors will not be permitted to sell and deliver the articles they may have entered for exhibition; nor to bring fruit, nor any other article, for the purpose of sale, on a penalty of forfeiture of all premiums, but such articles must remain in charge of the officers until the close of the exhibition.

Any exhibitor interfering with awarding committees, while in the discharge of their duties, will be held, by so doing, to have forfeited all premiums.

For Awarding Committees. — 1. The division superintendent will be a member and clerk of the Awarding Committee for his division. The remaining members of each committee will be selected with great care from the best horticulturists of this and neighboring states. The names of such persons will not be made public until the time of the fair.

2. Members of the Awarding Committee are requested to report to the president, at the secretary's office, on or before noon of the second day of the fair, that the places of those failing to report may be supplied.

3. The president is chairman of the committee on nomenclature; but to expedite the business of correction, the superintendent of each division will correct the nomenclature of his division, appealing to the chairman in all doubtful cases, and attaching the committee's card in all cases in which corrections are made.

4. No exhibitor will be permitted to act on a committee in a class in which he shall exhibit for premiums.

5. Members of the Awarding Committees are requested to report to the president, at the secretary's office, at 1 o'clock P. M. on Thursday, when they will receive their committee books, together with such explanations and instructions as may at the time seem needful.

6. Upon conclusion of their labors, not later than the after-

Rules for Exhibition (Mich. Hort. Society), continued.

noon of Friday, Awarding Committees will deliver their reports to the president, who will examine them, and in case of insufficiency or omission, will return them with instructions. When accepted by the president, they will be delivered to the secretary.

7. When an exhibit is not deemed worthy of a premium, the committee will withhold the award.

8. A majority of an Awarding Committee, when present, shall constitute a quorum, and of those present the first on the list shall act as chairman, unless the committee shall arrange otherwise.

9. Awarding Committees, in estimating the comparative values of exhibits, are instructed to base such estimates strictly upon the varieties in such collections that shall be correctly labeled by the exhibitors, prior to the corrections of the committee on nomenclature.

10. In awarding premiums upon any and all exhibits of fruits, committees will exclude any and all unlabeled and incorrectly labeled specimens, as well as duplicates, and consider: 1st, the value of the varieties for the required purpose, as given in the Society's Catalogue of Fruits; 2d, the color, size and evenness of the specimens; 3d, their freedom from the marks of insects and other blemishes; 4th, the apparent carefulness in handling and the tastefulness of the exhibit, recollecting that the gradations of the catalogue call for perfect specimens. These gradations should, therefore, be correspondingly lowered in case of deficiencies or imperfections. A copy of the catalogue, will, for this purpose, be furnished to each committee. In grading collections entered for family purposes, the dessert and culinary sub-columns should be consulted, and the gradation expressing the highest value taken. For market, the gradations of the market sub-column only should be employed.

11. In the case of fruits not named in the catalogue, for the dessert, committees should consider: 1st, quality; 2d, beauty; 3d, size. For culinary uses: 1st, flavor; 2d, texture; 3d,

Rules for Exhibition, continued.

size. For market: 1st, productiveness; 2d, color; 3d, handling qualities; 4th, suitable, even size.

12. The true and legitimate purpose of the premiums offered is to draw out the views of both exhibitors and committees respecting the relative values, for the purposes specified, of the varieties included in the exhibits.

13. The society desires to encourage the planting of only a sufficiently large variety of sorts for the desired purpose. Hence it is important that the committee, in their reports, specify, in the order of their value, the varieties upon which the determination of their awards is based.

14. Useful and valuable varieties only are expected to influence awards; while indifferent sorts, even though large, showy and attractive, should not, for these reasons alone, be held to add to the value of an exhibit, except, possibly, as a means of education.

15. An important object of the society is to collect valuable information of a pomological character. Committees are therefore requested to gather all the information possible from the exhibitors in their classes, and to make their reports as full as time and circumstances will permit.

16. The society desires to foster a free exercise, by exhibitors, of the principles of correct taste in the arrangement, display and ornamentation of their exhibits. To this end, committees will give all reasonable and proper consideration to particulars of this character.

CHAPTER XVII.

Postal Rates and Regulations.

1. Classes of Domestic Mail Matter, and Rates.

First Class.—Letters, postal cards, and matter wholly or partly in writing, whether sealed or unsealed (except manuscript copy accompanying proof sheets or corrected proof-sheets of the same), and all matter sealed or otherwise closed against inspection.

Rate.—Two cents per ounce or fraction thereof. Postal cards, one cent each. On "drop" letters, two cents per ounce or fraction thereof, when mailed at letter-carrier offices; and one cent per ounce or fraction thereof at other offices.

Second Class.—Newspapers and publications issued at stated intervals as often as four times a year, bearing a date of issue and numbered consecutively, issued from a known office of publication, and formed of printed sheets, without board, cloth, leather or other substantial binding. Such publications must be originated and published for the dissemination of information of a public character, or devoted to literature, the sciences, art, or some special industry. They must have a legitimate list of subscribers, and must not be designed primarily for advertising purposes, or for free circulation at nominal rates.

Rate.—One cent per pound or fraction thereof when sent by publisher thereof and from office of publication, including sample copies, or when sent from news agency to actual subscribers or other news agents.

One cent for each four ounces or fraction thereof on news-

Classes of Domestic Mail Matter, and Rates, continued.

papers and periodical publications of second class when sent by other than publisher or news agent.

One cent each on newspapers (excepting weeklies) and periodicals not exceeding two ounces in weight, when deposited in letter-carrier office for delivery by carrier; two cents each on periodicals weighing more than two ounces.

One cent per pound on newspapers, other than weeklies, and periodicals when deposited by publisher or news agent in letter-carrier office for general or box delivery; one cent for four ounces or fraction thereof when deposited by other than publishers or news agents, for general or box delivery.

One cent per pound or fraction thereof on weekly newspapers deposited by publisher or news agent in letter-carrier offices for letter or box delivery, or delivery by carrier; one cent for each package not exceeding four ounces, and one cent for each additional four ounces or fraction thereof when deposited by other than publisher or news agent.

Free when one copy is sent to each actual subscriber residing in county where same are printed, in whole or in part, and published; but at rate of one cent per pound when delivered at letter-carrier office, or distributed by carriers.

THIRD CLASS.—Books, periodicals and matter wholly in print (not included in second class), proof-sheets, corrected proof-sheets, and manuscript copy accompanying the same.

"Printed matter" is the production upon paper, by any process except that of handwriting, of any words, letters, characters figures, or images, or of any combination thereof, not having the character of an actual and personal correspondence.

A "circular" is a printed letter, which, according to internal evidence, is being sent in identical terms to several persons. It is permissible to write, in circulars, the date, the name of the person addressed, or of the sender, and to correct mere typographical errors.

Rate.—One cent for each two ounces or fraction thereof.

FOURTH CLASS.—Merchandise; namely, all matter not em-

Classes of Domestic Mail Matter, and Rates, continued.

braced in the other three classes, and which is not in its form or nature liable to destroy, deface or otherwise damage the contents of the mail bag, or harm the person of any one engaged in the postal service, and not above the weight provided by law. Includes seeds and plants.

Rate.—One cent per ounce or fraction thereof; or on seeds, cuttings, roots, scions and plants, one cent for each two ounces or fraction thereof.

2. Foreign Postage.

To Canada and Mexico, the rates are the same as domestic postage.

In the Universal Postal Union, which includes nearly all the countries of the world except New Zealand and most Australian provinces, rates are as follows:

Letters, ½ ounce		5 cents.
Postal cards, each		2 "
Newspaper and other printed matter, per 2 ounces		1 "
Commercial papers.	Packets not in excess of 10 ozs.	5 "
	Packets in excess of 10 ounces, for each 2 ounces or fraction thereof	1 "
Samples of merchandise.	Packets not in excess of 4 ounces	2 "
	Packets in excess of 4 ozs., for each 2 ounces or fraction thereof	1 "
Registration fee on letters or other articles		10 "

The rates to New Zealand, New South Wales, Queensland, Victoria and Tasmania are: 12 cents (per ½ oz.) on first-class matter, 2 cents a copy for newspapers, 4 cents for single rate (4 oz.) on printed matter other than newspapers and merchandise. Rates to China are 13 cents for a half ounce of first-class matter, 5 cents for a single rate (4 oz.) on newspapers, 4 cents for a single rate (2 oz.) on other printed matter and merchandise. For Cape Colony, Natal, most of Morocco, and some other

Foreign Postage, continued.

parts of Africa, and some islands, the rate is 15 cents on a half ounce of first class matter For Cape Colony and Natal, newspapers demand 4 cents for a single rate (4 oz.), and other printed matter and merchandise, 5 cents for a single rate (2 oz.).

3. Unmailable Matter.

Held for Postage.—Domestic matter of first class on which two cents has not been prepaid, and all other domestic matter not fully prepaid.

Misdirected.—Matter without address, or so incorrectly, insufficiently or illegibly addressed that it cannot be forwarded to destination, including "nixies" or matter not addressed to a Post Office, or addressed to a Post Office without the name of the State being given, or otherwise so incorrectly, illegibly or insufficiently addressed that it cannot be transmitted.

Destructive.—Matter of a harmful nature, poisons, explosive or inflammable articles, live animals or dead animals not stuffed, fruits or vegetable matter liable to decomposition, comb-honey, guano, articles exhaling a bad odor, vinous, spiritous and malt liquors, liquids liable to explosion, spontaneous combustion, or ignition by shock or jar (for example, kerosene oil, naphtha, benzine, turpentine, etc.). Bees and dried insects or reptiles must be so put up as not to injure any one handling the mails, nor soil mail bags or their contents.

Coin and Jewelry.—Coin, jewelry and other precious articles prohibited by postal treaty from being sent in the mails to foreign countries.

Scurrilous Matter.—Matter upon the envelope or outside cover or wrapper of which, or any postal-card upon which, any delineations, epithets, terms, or language of an indecent, lewd, lascivious, obscene, libelous, scurrilous, defamatory or threatening character, or calculated by the terms or manner or style of display, and obviously intended to reflect injuriously upon the character or conduct of another, may be written or printed, or otherwise impressed or apparent.

Unmailable Matter, continued.

Obscene Matter.—Every obscene, lewd or lascivious book, pamphlet, picture, paper, letter, writing, print or other publication of an indecent character, and every article or thing designed or intended for the prevention of conception or procuring of abortion, and every article or thing intended or adapted for any indecent or immoral use, and every written or printed card, letter, circular, book, pamphlet, advertisement, or notice of any kind giving information, directly or indirectly, where or how, or of whom, or by what means any of the hereinbefore mentioned matters, articles or things may be obtained or made, whether sealed as first-class matter or not.

Lottery Matter.—Letters and circulars known to be concerning lotteries, gift concerts, etc., or concerning any scheme devised and intended to deceive and defraud the public for the purpose of obtaining money under false pretenses.

Mutilated.—Matter recovered from wrecked or burned mail cars or vessels, or matter damaged so that it cannot be forwarded to destination. All matter found loose in the mails, separated from the wrapper, label or envelope containing the address, so that the direction cannot be known; and the matter recovered from depredations on the mails and to be restored to the owners upon due proof of ownership.

Excess of Weight and Size.—Packages of domestic third and fourth class matter, weighing more than four pounds (except single books and official matter emanating from the Departments at Washington), and of foreign matter in excess of weight or size fixed by stipulation of postal treat

CHAPTER XVIII.

Weather Signs, and Protection from Frost.

Stationary barometer indicates continuance of the present weather.

Slowly rising barometer usually indicates fair weather.

Slowly falling barometer indicates the approach of a severe storm. One-fifth to one-third of an inch is sufficient fall to give indications.

Sudden rise of the barometer indicates the approach of a storm or the breaking up of an existing storm.

Sudden fall of the barometer indicates high wind and probable rain.

When areas of low and high barometer are near together, heavy gales may be expected.

Long lines of cloud extending up the sky from a common starting point often foretell a storm from that quarter.

When the fleecy or cirrus clouds settle down into horizontal bars, or ribs, in the upper sky, wet and foul weather may be expected. This is the "mackerel sky."

If contiguous clouds move in various directions, rain is likely to follow soon.

When small black clouds scud over an overcast sky, heavy rain and bad weather may be expected.

Cumulus clouds that preserve a well rounded form and float high in the air indicate fair weather.

Anvil-shaped cumulus clouds usually indicate thunder storms.

In spring and fall rain is often indicated by a dense bank of

gray clouds in the east, in front of which are little shoals of blackish clouds.

Cirro-cumulus clouds—like bunches and fleeces of wool scattered high in the sky—are indications of still and dry weather.

When the rays of the rising sun shoot far up into the sky, fair weather may be expected.

When the ray-like shadows of clouds over-lie a hazy sky in the vicinity of the sun, rain is apt to follow. This is expressed in the phrase "the sun drawing water."

Gaudy hues of blue and purple at sunset prophesy rain and wind.

A bright red sunset means fair weather for the morrow.

A pale and diffuse sun at setting portends a storm.

If the sun sets in subdued purple and the zenith is pale blue, fair weather may be expected

A deep red morning sky is usually followed by bad weather.

A rosy or gray morning sky means good weather.

A sonorous condition of the atmosphere foretells rain.

A bank of cloud across the southern horizon in winter indicates snow. It is frequently called the "snow-bank."

If the sun rises clear, but becomes over-cast within half an hour, prepare for rain.

A halo about the moon indicates a rain storm.

If the sky is white or yellowish-white nearly to the zenith after sunset, prepare for rain soon.

Strong east winds indicate a storm.

Haziness is indicative of dry weather. It is due to dust in the atmosphere

When haziness suddenly disappears and the sun sets pale and the sky is very clear, rain is probable.

When stars twinkle with unusual prominence, rain may be expected.

Heavy dew indicates fair weather.

Absence of dew for two or three mornings in succession in summer is a precursor of rain

To Predict Frost (Kedzie).—

1. When the sunshine is very hot and the shade very cold and the shadows very deep, "there is frost in the air," because the air is very dry and radiation of heat little checked.

2. When the dew point is more than 10° F. above frost point, there is little danger of frost. To find approximately the temperature of dew point when the temperature of the air is between 45° and 65° F., multiply the difference between the wet-bulb and dry-bulb thermometers by two and subtract the product from temperature of dry-bulb. If the remainder is above 42° F., there is little danger of frost. The nearer this remainder comes to 32°, the greater the danger of frost, especially if the air is still and clouds disappear at sunset.

To Protect Plants from Light Frosts.—

1. Make a smudge in the garden or vineyard at night when the frost is expected. Rubbish or litter and tar make the best smudge.

2. Syringe the plants thoroughly at night-fall.

CHAPTER XIX.

Collecting and Preserving.

I. Collecting and Preserving Plants.

Collect samples of all parts of the plant, lower and upper, leaves, stem, flowers, fruit, and, in most cases, roots. In small species, those two feet high or less, the whole plant should be taken. Of larger plants, take portions about a foot long. Press the plants between papers or "driers." These driers may be any thick porous paper, as blotting paper or carpet paper, or, for plants which are not succulent or very juicy, newspapers in several thicknesses may be used. It is best to place the specimens in sheets of thin paper—grocer's tea-paper is good—and place these sheets between the driers. Many specimens can be placed in a pile. On top the pile place a short board and a weight of ten or a dozen pounds. Change the driers every day. The plants are dry when they become brittle and when no moisture can be felt by the fingers. Some plants will dry in two or three days while others require as many weeks. If the pressing is properly done the specimens will come out smooth and flat, and the leaves will usually be green, although some plants always turn black in drying.

Specimens are usually mounted on single sheets of white paper of the stiffness of very heavy writing paper or thin Bristol board. The standard size of sheet is 11½x16½ inches. The plants may be pasted down permanently and entirely to the sheet, or they may be held on by strips of gummed paper. In the former case, Denison's fish glue is the best

Collecting and Preserving Plants, continued.

gum to use. But one species or variety should be placed on a sheet. The species of a genus are collected into a genus cover. This cover is a folded sheet of heavy manilla or other firm paper, and the standard size, when folded, is 12x16½ inches. On the lower left hand corner of this cover the name of the genus is written. A label should accompany each specimen upon the separate sheets. The specimens are now ready to be filed away on shelves in a horizontal position. If insects attack the specimens, they may be destroyed by fumes of bisulphide of carbon or chloroform. In this case it is necessary to place the specimens in a tight box and then insert the liquid. Usually, however, specimens are dipped in poison, and then dried, before being mounted.

HERBARIUM POISONS. 1. 120 grains of arsenic acid dissolved in a quart of alcohol. The arsenic acid is very deliquescent and the bottle must be kept tightly corked. This is Dr. Gray's favorite preparation, and is used in the herbarium at Harvard University.

2. Place as much corrosive sublimate in alcohol as the liquid will dissolve. If the poison is applied with a brush, care must be taken to avoid one with iron trimmings, as the sublimate corrodes the iron.

3. Dissolve 1¾ oz. of corrosive sublimate in 1 pt. of alcohol; add 2½ fluid drams of carbolic acid and apply with a paint brush.

4. 1 lb. of corrosive sublimate, 1 lb. of carbolic acid to 4 gals. of methylated spirit.

Camphor, frequently renewed in each cabinet, is often sufficient to prevent the attack of insects.

2. Preserving and Printing of Flowers and Other Parts of Plants.

TO PRESERVE THE COLOR OF DRIED FLOWERS.—1. Immerse the stem of the fresh specimen in a solution of 32 parts by weight of alum, 4 of nitre and 186 of water for two or three days until the liquid is thoroughly absorbed, and then

Preserving and Printing of Flowers and Plants, continued.

press in the ordinary way, except that dry sand is sifted over the specimen and the packet submitted to the action of gentle heat for twenty-four hours.

2. Make a varnish composed of 20 parts of powdered copal and 500 parts of ether, powdered glass or sand being used to make the copal dissolve more readily. Into this solution the plants are carefully dipped; then they are allowed to dry for 10 minutes, and the same process is repeated four or five times in succession.

3. Plants may also be plunged in a boiling solution of 1 part of salicylic acid and 600 of alcohol, and then dried in bibulous paper. But this should be very rapidly done, violet flowers especially being decolorized by more than an instantaneous immersion.

4. Red flowers which have changed to a purplish tint in drying may have their color restored by laying them on a piece of paper moistened with dilute nitric acid (1 part to 10 or 12 parts of water), and then submitting them to moderate pressure for a few seconds; but the solution must not touch the green leaves, as they would be decolorized by it.

5. *With Sulphur.* (Quin.)—Procure a chest about 3 or 4 ft. square, with a small opening in the under part of one side, to be closed by a bar, through which the basin containing brimstone must be put into the chest; this opening must be covered inside with perforated tin, in order to prevent those flowers which hang immediately over the basin from being spoiled. Paper the inside to render it air-tight. When the chest is ready for use, nail small laths on two opposite sides of the interior, at a distance of about 6 inches apart, upon which lay thin round sticks upon which to arrange the flowers; these should not be too close together, or the vapor will not circulate freely through the vacant spaces around the flowers. When the chest is sufficiently full of flowers close it carefully, place a damp cloth on the sides of the lid, and some heavy stones upon the top of it; then take small pieces of brimstone, put them

Preserving and Printing of Flowers and Fruits, continued.

in a small flat basin, kindle and put through the opening in the bottom of the chest and shut the bar. Leave the chest undisturbed for twenty-four hours, after which time it must be opened, and if the flowers be sufficiently smoked they will appear white; if not they must be smoked again. When sufficiently smoked, take the flowers out carefully and hang them up in a dry airy place in the shade, and in a few days or even hours they will recover their natural color, except being only a shade paler.

To give them a very bright and shining color, plunge them into a mixture of 10 parts of cold water and 1 of good nitric acid; drain off the liquid, and hang them up again the same as before. The best flowers for this process are asters, roses, fuchsias (single ones), spiræas (red-flowered kinds, such as callosa, Douglasi, etc.), ranunculus, delphiniums, cytisus, etc. The roses ought to be quite open, but not too fully blown.

6. *In sand.* (Quin.)—Dry the plants in clean silver sand, free from organic matter (made so by repeated washing, until the sand ceases to discolor the water). Heat the sand rather high, and mix with it by constant stirring a small piece of composite candle, which prevents the sand from adhering to the flowers. Have a box not higher than 3 inches but as broad as possible; this box should have instead of a bottom a narrow-meshed iron-wire net at a distance of ¾ inches from where the bottom should be. Place the box on a board and fill with sand till the net is just covered with a thin layer of sand; upon this layer of sand place a layer of flowers, on that a layer of sand, then flowers, and so on; the layers of sand should vary in thickness according to the kind of flowers, from ⅛ inch to ¼ inch.

When the box contains about three layers of flowers, it must be removed to a very sunny dry place, the best being close under the glass in an empty greenhouse, exposed to the full influence of the sun. After a week, if the weather is sunny and dry, the flowers will be perfectly dried; then the box is

Preserving and Printing of Flowers and Plants, continued.

lifted a little, the sand falls gently through the iron net, and the flowers remain in their position over the net without any disturbance whatever.

They should then be taken out carefully and kept in a dry and, if possible, dark place, where no sun can reach them, and afterwards they will keep very well for many years.

Care should be taken that the flowers are cut in dry weather and that, while laying in the sand, no part of a flower shall touch another part, as this always spoils the color and causes decay. Sand should be filled in between all the parts of the flower; therefore it is necessary to insert the double flowers in an erect position, in order to fill the sand between the petals, while most of the single flowers must be put in with the stalks upwards.

To Keep Fresh Flowers.—If cut-flowers are not needed immediately, wet them and then wrap them in paper and place in a box in a cool place. Keep as cool as possible without freezing.

The disagreeable odor which comes from flowers in vases is due to the decay of the leaves and stems in the water. Therefore remove all the lower leaves before putting flowers in vases.

Flowers which have stood in a vase for a day or so can be greatly refreshed if taken from the vase at night, thoroughly sprinkled, wrapped, stems and blossoms and all, as closely as possible in a soaked cloth, and laid aside until the morning. They will be much fresher than if they had been left in their vases, yet will not have bloomed out so much. Before thus laying them aside, and again in the morning, a bit of each stem should be cut off, as the end soon hardens. This ought also to be done once or twice a day, even if the flowers are kept constantly in their vases. Roses which have drooped before their time—as, for example, when worn on the dress—may be wonderfully revived if the stems, after being thus cut are placed for ten minutes in almost boiling water and then re-

Preserving and Printing of Flowers and Plants, continued.

moved to cold water. It is also well to add a little charcoal or ammonia to the water in which flowers are standing.

If salt is added to the water in which cut-flowers are kept, it will delay wilting and decay.

PRINTING PLANTS.—1. First, lightly oil one side of the paper, then fold in four, so that the oil may filter through the pores, and the plant may not come into direct contact with the liquid. The plant is placed between the leaves of the second folding, and in this position pressed (through other paper) all over with the hand, so as to make a small quantity of oil adhere to its surface. Then it is taken out and placed between two sheets of white paper for two impressions, and the plant is pressed as before. Sprinkle over the invisible image remaining on the paper, a quantity of black-lead or charcoal, and distribute it in all directions; the image then appears in all its parts. With an assortment of colors the natural colors of plants may be reproduced. To obtain fixity, resin is previously added to the black-lead in equal parts. Expose to the heat sufficient to melt the resin.

2. The best paper to use is ordinary wove paper without water-marks; if it can be afforded, use thin drawing paper. First, select the leaves, then carefully press and dry them. If they be placed in a plant press, care must be taken not to put too great pressure on the specimens at first, or they will be spoiled for printing. An old book is the best for drying the samples to be used. Take printer's or proof ink, and a small leather dabber; work a bit of ink about the size of a pea, on a small piece of slate or glass with the dabber until it is perfectly smooth. A drop or two of linseed oil will assist the operation. Then give the leaf a thin coating, being careful to spread it equally; then lay the leaf ink downwards on a sheet of paper and place it between the leaves of an old book, which must then be subjected to a moderate pressure in a copying press, or passed between the rollers of a ringing machine. Impressions can be taken with greater rapidity by

Preserving and Printing of Flowers and Plants, continued.

laying the book on the floor and standing upon it for a few seconds. Soft book paper is the best, and, previous to using it, place a few sheets between damp blotting paper, which causes it to take the ink still more readily. At first you will find that you lay on too much ink. If the impression is too black, use the leaf again. If the midrib of the leaf is too thick, it must be shaved down with a sharp knife.

3 *Leaf-Prints.* (Engle.)—1. A small ink roller, such as printers use for inking type. 2. A quantity of green printer's ink. 3. A pane of stout window glass (the larger the better) fastened securely to an evenly planed board twice the size of the glass. A small quantity of the ink is put on the glass and spread with a knife, after which it is distributed evenly by going over in all directions with the ink roller. When this has been carefully done, the leaf to be copied is laid on a piece of waste paper and inked by applying the roller once or twice with moderate pressure. This leaves a film of ink on the veins and network of the leaf, and by placing it on a piece of blank paper and applying considerable pressure for a few moments the work is done, and when the leaf is lifted from the paper the impress remains with all its delicate tracery, faithful in color and outline to the original.

To make the ink of proper consistency, add several drops of balsam copaiba to a saltspoonful of ink. In case the leaf sticks, the ink is too thick.

Skeletonizing Plants.—1. *By Maceration.*—Place the leaves in water, and allow them to remain in the same water for from three to four months, until the soft matter decays, and the stem may be taken in the hand, and the refuse shaken away. There remains behind a network or skeleton of the original object, which can be bleached with a little lime. Leaves and pods may both be treated satisfactorily in this manner. The pod of the 'Jimson weed" or *Datura Stramonium* is a favorite for this purpose.

2. *By Chemicals.*—Chloride of lime, ¼ lb.; washing soda,

Prosorving and Printing of Flowers and Plants, continued.

½ lb. Put the soda into 1½ pts. boiling water, (rain water is best) and let it thoroughly dissolve. Put the chloride of lime in a large pitcher, and add same quantity of cold water. Stir well and cover closely, to prevent the escape of the chlorine. When the soda water is cool, pour it on the chloride of lime, stir well together and cover tightly, leaving it for an hour or more. Then pour off very gently the clear liquid, which must be bottled tightly.

This solution will remove fruit stains from white goods, and will bleach any vegetable substances. When used for cotton or linen, it must be considerably diluted, and the goods well rinsed afterwards.

3. Perfumery.

PERMANENT ATTAR OR OTTO OF ROSES (Ellwanger).—The roses employed should be just blown, of the sweetest smelling kinds, gathered in as dry a state as possible. After each gathering, spread out the petals on a sheet of paper and leave until free from moisture; then place a layer of petals in the jar, sprinkling with coarse salt; then another layer of coarse salt alternating until the jar is full. Leave for a few days, or until a broth is formed; then incorporate thoroughly and add more petals and salt, mixing thoroughly daily for a week, when fragrant gums and spices should be added, such as benzoin, storax, cassia buds, cinnamon, cloves, cardamon and vanilla bean. Mix again and leave for a few days, when add essential oil of jasmine, violet, tuberose and attar of roses, together with a hint of ambergris or musk, in mixture with the flower ottos to fix the odor. Spices, such as cloves, should be sparingly used.

PERFUME JAR—1. One lb. of dried rose petals bought at a drug store, 4 ozs. of salt and 2 ozs. of saltpeter, on which put 8 drops of essence of ambergris, 6 drops of essence of lemon 4 drops oil of cloves, 4 drops oil of lavender, and 2 drops of essence of bergamont.

2. Half lb. of common salt, ¼ lb. saltpeter, ¼ oz. of storax. ½ doz. cloves, a handful of dried bay leaves, and an-

Perfumery, continued.

other handful of dried lavender flowers. This basis will last for years, and petals of roses and of other fragrant flowers gathered on dry days may be added annually. Or, powdered benzoin, chips of sandal-wood, cinnamon, orris root or musk may be added.

LAVENDER BAG.—One-half lb. lavender flowers, ½ oz. dried thyme and mint, ¼ oz. ground cloves and caraway, 1 oz. common salt. Tie up in a linen bag, which is hung in the wardrobe.

Orris root is a good medium in which to place delicate perfumes for perfumery bags.

4. Collecting and Preserving Insects.

Flying insects are caught in a net made of musquito bar, after the fashion of the minnow net. The bar is made into a bag about a yard deep, and about a foot in width at the top. The opening is fastened upon a wire hoop, which is secured to a pole, as a broom-stick. Insects are killed by placing them in a "cyanide bottle." This is prepared by placing two or three lumps of cyanide of potassium the size of a quail's egg in a museum bottle or glass jar, covering the lumps with dry plaster of Paris, and then adding just enough water to make the plaster set. The fumes of the poison coming through the plaster quickly kills the insects. Keep the bottle corked. The cyanide is very poisonous and the fumes should not be inhaled. A very broad-mouthed bottle with glass stopple is best. Bugs and beetles can be pinned and mounted as soon as they are dead. It is customary to pin beetles through the right wing-cover, and bugs—as squash-bug—through the triangular space between the wings. Butterflies, moths, bees, flies, etc., must be pressed to preserve the wings. This is done by placing on a "setting board." This apparatus is a little trough with a crack at the bottom. The sides of the trough are made of thin bits of board, three or four inches wide and a foot or more long. These sides have very little slant. The crack in the

Collecting and Preserving Insects, continued.

bottom of the trough is left about a half-inch wide, and it is covered beneath with a strip of cork. The body of the insect is now placed lengthwise the crack, a pin is thrust through the thorax, or middle division of the insect, into the cork, and the wings are laid out on the sides of the trough. The wings are held in place by strips of card-board pinned over them, care being taken not to stick the pins through the wings. In about two weeks the insects will be dry and stiff.

Insects must be kept in tight boxes to keep other insects from devouring them. Cigar boxes are good. Tight boxes with glass covers are generally used by large collectors. Place sheets of cork in the bottom of the box to receive the pins. If insects attack the specimens, expose them in a tight box to vapors of bisulphide of carbon or benzine.

CHAPTER XX.

Elements, Symbols and Analyses.

The Elements and their Symbols, and the Composition of Various Substances.

Aluminum	Al.	Mercury	Hg.
Antimony	Sb.	Molybdenum	Mo.
Arsenic	As.	Nickel	Ni.
Barium	Ba.	Nitrogen	N.
Bismuth	Bi.	Osmium	Os.
Boron	B.	Oxygen	O.
Bromine	Br.	Palladium	Pa.
Cadmium	Cd.	Phosphorus	P.
Cesium	Cs.	Platinum	Pt.
Calcium	Ca.	Potassium	K.
Carbon	C.	Rhodium	Rh.
Cerium	Ce.	Rubidium	Rb.
Chlorine	Cl.	Ruthenium	Ru.
Chromium	Cr.	Scandium	Sc.
Cobalt	Co.	Selenium	Se.
Columbium	Cb.	Silicon	Si.
Copper	Cu	Silver	Ag.
Didymium	D.	Sodium	Na.
Erbium	Er.	Sirontium	Sr.
Fluorine	F.	Sulphur	S.
Gallium	Ga	Tantalum	Ta
Glucinum	Gl.	Tellurium	Te.
Gold	Au.	Thallium	Tl.
Hydrogen	H.	Thorium	Th.
Indium	In.	Tin	Sn.
Iodine	I.	Titanium	Ti.
Iridium	Ir.	Tungsten	Wo.
Iron	Fe.	Uranium	Ur.
Lanthanum	La.	Vanadium	V.
Lead	Pb.	Yttrium	Y.
Lithium	Li.	Zinc	Zn.
Magnesium	Mg.	Zirconium	Zr.
Manganese	Mn.		

The Composition of Various Substances.

Acetic Acid.....	$C_2H_7O_2$	Nitric Acid.....	HNO_3
Ammonia	NH_3	Nitric Oxide.....	NO
Aniline	$NH_2(C_6H_5)$	Nitrous Oxide....	N_2O
Arsenious Oxide .	As_4O_6	Nitric Peroxide ..	NO_2
Carbonic Oxide ..	CO	Sulphuretted Hydrogen	H_2S
Carbonic Dioxide	CO_2	Sulphurous Oxide	SO_2
Chloroform.....	$CHCl_3$	Sulphuric Oxide .	SO_3
Ferric Oxide.....	Fe_2O_3	Sulphuric Acid...	H_2SO_4
Ferrous Oxide ...	FeO	Water	H_2O
Hydrochloric Acid	HCl		
Mercuric Oxide ..	HgO		

2. Analyses.

Compiled from many reliable sources, largely from the labors of Drs. Goessmann and S. W. Johnson.

(*a.*) General Analyses of Fruits and Fruit Plants.

1. *Various Fruits* (*Fresenius*).

	Sugar.	Free Acid.	Albuminous substance.	Pectous substance.	Soluble matter.	Water.
Apples	6.83	.85	.45	.47	14.96	82.04
Apricots.....	1.531	.766	.389	9.283	12.723	82.115
Austrian Grape ..	13.78	1.020	.832	.498	16.49	79.997
Cultivated Strawberries..... ..	7.575	1.133	.359	.119	9.666	87.474
Cultivated Raspberries.....	4.708	1.356	.544	1.746	8.835	86.557
Green Grape.....	2.96	.96	.477	10.475	15.19	80.841
Heart Cherries ..	13.11	.351	.903	2.286	17.25	75.37
Mulberries	9.193	1.86	.394	2.031	14.043	84.707
Peaches	1.580	.612	.463	6.313	9.39	84.99
Pears	7.00	074	.26	3.281	10.90	83.95
Red Currants. ..	4.78	2.31	.45	.28	8.36	85.84
Red Gooseberries.	8.063	1.358	.441	9.69	11.148	85.565
Wild Raspberries.	3.599	1.980	.546	1.107	7.500	83.86
Wild Strawberries	3.247	1.650	.619	.145	6.398	87.271

Analyses, continued.

2. *Sub-Tropical Fruits* (*Parsons*).

	Water.	Crude protein.	Free acids.	Glucose Sugar.	Cane Sugar.	Ether extract.	Crude fibre.	Ash.	Albuminoid nitrogen.	Nitrogen-free extract.
Sweet Pomegranates.....	78.27	1.33	.368	11.61	1.04	1.24	2.63	.761	.177	15.77
Sour "	75.41	1.60	1.85	10.40	.26	2.05	2.83	.544	.203	17.57
Persimmons.....	66.12	.827	.000	13.54	1.03	.701	1 78	.861		29.71
Florida Oranges, Bitter-sweet..	86.86	.815	.417	5.71	.84	.243				
" Tangierine...	83.56	.792	.477	6.00	3.41	2.50				
" Mandarin....	79.95	.834	.855	4.77	8.07	.146				
" Bloods.....	85.57	.700	.670	5.70	3.94	.100				
" Navels.....	83.70	1.12	.662	6.03						
" Russets	83.18	.905	.817	7.29	4.51					
" Common	86.58	.862	.756	4.60	4.38	.076				
" Sour.....	86.76	1.03	2.55	3.36	.97	.125				
Messina Oranges, Guy Pope...	86.22	.980	1.18	5.95	1.82	.166				

Analyses, continued.

3. *Strawberries, Average of 20 Varieties.* (*Stone.*)

Water	90.52
Solids	9.48
Free acid	1.37
Glucose	4.78
Glucose after inversion	5.46
Difference calculated as cane sugar	0.58
COMPOSITION OF DRY MATTER.	
Ash	6.53
Crude fiber	16.35
Ether extract	6.75
Crude protein	10.51
Non-nitrogenous extract	60.79

4. *Raspberries.* (*Weber.*)

	Reliance.	*Gregg.*
Sugar	1.78	2.82
Acid	.92	.64
Seed	3.5	5.612
Pectose, protein, combined acids, etc.	3.92	5.91
Ash	.43	.42
Fiber	.32	.48
Water	89.13	84.12

5. *Peach, Branches.* (*Kedzie.*)

Ash constituents.	*Healthy.*	*Diseased by yellows.*
Silica, SiO_2	1.21	1.40
Oxide of iron, Fe_2O_3	0.92	0.84
Lime, CaO	43.67	45.02
Magnesia, MgO	2.53	2.40
Potash, K_2O	7.07	4.93
Soda, Na_2O	1.88	2.33
Phosphoric acid, P_2O_5	7.20	6.03
Sulphuric acid, SO_3	0.54	0.83
Carbon dioxide, CO_2	34.71	35.85
Chlorine	0.07	0.11
Moisture and loss	.30	0.26
Total	100.00	100.00

Analyses, continued.

6. *Peach, Fruit and Branches.* (*Goessmann.*)

Ash Constituents.	Fruit—Crawford's Early peach, healthy.	Fruit—Crawford's Early peach, diseased with yellows.	Branch—Crawford's Early peach, restored.	Branch—Crawford's Early peach, diseased with yellows.
	Per cent.	*Per cent*	*Per cent.*	*Per cent.*
Ferric oxide, Fe_2O_3 ...	.58	.46	.52	1.45
Calcium oxide, CaO ...	2.64	4.68	54.52	64.23
Magnesium oxide, MgO.	6.29	5.49	7.58	10.28
Phosphoric acid, P_2O_5.	16.02	18.07	11.37	8.37
Potassium oxide, K_2O .	74.46	71.30	26.01	15.67
Total.....	100.00	100.00	100.00	100.00

7. *Fertilizing Constituents in the Ash of Fruits.* (*Goessmann.*)

Name.	*Potash.*	*Soda.*	*Lime*	*Magn.*	*Phosphoric acid.*
Lombard Plums	76.59	.....	13.26	2.17	7.44
Peaches	74 46	.....	2.64	6.29	16.03
Baldwin Apples.....	63.54	1.71	7.28	5.52	20.87
Asparagus, stem	42.94	3.58	27.18	12.77	12.31
" roots.....	56.43	5.42	15.48	7.57	15.09
Clinton Grapes	57.40	3.51	13.10	7.24	17.87
Concord Grapes.....	62.29	.....	15.50	1.76	18.49
Cranberries	47.96	6.58	18.58	6.78	14.27
White Currants.....	53.81	.....	17.46	4.72	22.54
Black Raspberries	50.00	.....	19.44	9.60	20.47
Blackberries.....	51.42	.....	17.22	5.30	24.13
Blueberries	31.36	.....	28.02	9.25	29.05

(*b*) Analyses of Fruit and Garden Products with Reference to their Fertilizing Constituents

8. *Analysis of Garden Crops and Fruits for Fertilizing Constituents.* (*Wolff and Goessmann.*)

ONE THOUSAND PARTS OF THE PLANTS CONTAIN:

Name.	Water.	Nitrogen	Ash.	Potash.	Soda.
Corn, kernels	144.	16.0	12.4	3.7	0.1
stalk and leaves	150.	4.8	45.3	16.4	0.5
Potato, tubers	750.	3.4	9.5	5.8	0.3
vines	770.	4.9	19.7	4.3	0.4
Peas, seed	143.	35.8	23.4	10.1	0.2
vines	160.	10.4	43.1	9.9	1.8
Beans, seed	150.	39.0	27 4	12.0	0.4
vines	160.	. . . .	40.2	12.8	3.2
Carrots, roots	850.	2.2	8.2	3.0	1.7
leaves	822.	5.1	23.9	2.9	4.7
Sugar Beet, roots	815.	1.6	7.1	3.8	0.6
leaves	897.	3.0	15.3	4.0	2.0
White Turnip, roots	920.	1.8	6.4	2.9	0.6
leaves	898.	3.0	11.9	2.8	1.1
Swedish Turnip, roots	870	2.1	7.5	3.5	0.4
leaves	884.	3.4	19.5	2.8	0.8
White Cabbage, head	900.	3.0	9.6	4.3	0.8
roots	890.	2.4	15.6	5.8	1.5
Savoy Cabbage, head	871.	5.3	14.0	3.9	1.4
Cauliflower	904.	4.0	8.0	3.6	0.5
Horse-radish, roots	767.	4.3	19.7	7.7	0.4
Spanish Radish, roots	933.	1.9	4.9	1.6	1.0
Parsnip, roots	793.	5.4	10.0	5.4	0.2
Artichoke, roots	811.	. . . .	10.1	2.4	0.7
Asparagus, sprouts	933.	3.2	5.0	1.2	0.9
Common Onion, bulb	860.	2.7	7.4	2.5	0.2
Celery	841.	2.4	17.6	7.6	. . .
Spinach	923.	4.9	16.0	2.7	5.7
Common Lettuce	940.	. . . .	8.1	3.7	0.8
Head Lettuce	943.	2.2	10.1	3.9	0.8
Roman Lettuce	925.	2.0	9.8	2.5	3.5
Cucumber	956.	1.6	5.8	2 4	0.6
Pumpkin	900.	1.1	4.4	0.9	0.9
Rhubarb, roots	743.5	5.5	28.8	5.3	. . .
stem and leaves	916.7	1.3	17.2	3.6	0.3
Apples	831.	0.6	2.2	0.8	0.6
Pears	831.	0.6	3.3	1.8	0.3
Cherries	825.	. . . .	3.9	2.0	0.1
Plums	838.	. . . .	2.9	1.7	. . .
Gooseberries	903.	. . . .	3.3	1.3	0.3
Strawberries	902.	. . . .	3.3	0.7	0.9
Grapes	830.	1.7	8.8	5.0	0.1
seeds	110.	19.0	22.7	6.9	0.5

Analysis of Garden Crops and Fruits, continued.

ONE THOUSAND PARTS OF THE PLANTS CONTAIN:

NAME.	Lime.	Magnesia.	Phosphoric acid.	Sulphuric acid.	Chlorine.	Silicic acid.
Corn, kernels	0.3	1.9	5.7	0.1	0.2	0.3
stalk and leaves	4.9	2.6	3.8	2.4	0.6	13.1
Potato, tubers	0.3	0.5	1.6	0.6	0.3	0.2
vines	6.4	3.3	1.6	1.3	1.1	0.9
Peas, seed	1.1	1.9	8.4	0.8	0.4	0.2
vines	15.9	3.5	3.5	2.7	2.3	2.9
Beans, seed	1.5	2.1	9.7	1.1	0.3	0.2
vines	11.1	2.5	3.9	1.7	3.1	1 9
Carrots, roots	0.9	0.4	1.1	0.5	0.4	0 2
leaves	7 9	0.8	1.0	1.8	2.4	2.4
Sugar Beet, roots	0.4	0.6	0.9	0.3	0.3	0.2
leaves	3.1	1.7	0.7	0.8	1.3	1.6
White Turnip, roots	0.7	0.2	0.8	0.7	0.3	0.1
leaves	3.9	0.5	0.9	1.1	1.2	0.5
Swedish Turnip, roots	0.9	0.3	1.1	0.7	0.5	0 1
leaves	6.5	0.8	2.0	2.3	1.5	2.1
White Cabbage, head	1.2	0.4	1.1	1.3	0.5	0.1
roots	2.8	0.6	1.4	2.4	1.3	0.1
Savoy Cabbage, head	3.0	0.5	2.1	1.2	1.1	0.7
Cauliflower	0.5	0.3	1.6	1.0	0.3	0.3
Horse-radish, roots	2.0	0.4	2.0	4.9	0.3	1.5
Spanish Radish, roots	0.7	0.2	0.5	0.3	0.5	. .
Parsnip, roots	1.1	0.6	1.9	0.5	0.4	0.2
Artichoke, roots	1.0	0.4	1.1	1.3	0.5	0.1
Asparagus, sprouts	0.6	0.2	0.9	0.3	0.3	0.5
Common Onion, bulb	1.6	0.3	1.3	0.4	0.2	0.7
Celery	2.3	1.0	2.2	1.0	2.8	0.7
Spinach	1.9	1.0	1.6	1.1	1.0	0.7
Common Lettuce	0.5	0.2	0.7	0.3	0.4	1.3
Head Lettuce	1.5	0.6	1.0	0.4	0.8	0.8
Roman Lettuce	1.2	0.4	1.1	0.4	0.4	0.3
Cucumber	0.4	0.2	1.2	0.4	0.4	0.5
Pumpkin	0.3	0.2	1.6	0.1	. . .	0.3
Rhubarb, roots	5.0	1.6	0.6	. . .	. . .	. . .
stem and leaves	3.4	1.3	0.2	. . .	. . .	. . .
Apples	0.1	0.2	0.3	0.1	. . .	0.1
Pears	0.3	0.2	0.5	0.2	. . .	0.1
Cherries	0.3	0.2	0.6	0.2	0.1	0.4
Plums	0.3	0.2	0.4	0.1	. . .	0.1
Gooseberries	0.4	0.2	0.7	0.2	. . .	0.1
Strawberries	0.5	. . .	0.5	0.1	0.1	0.4
Grapes	1.0	0.4	1.4	0.5	0.1	0.3
seeds	5.6	1.4	7.0	0.8	0.1	0.2

Analyses, continu

9. *Apple Pomace.*

Water	69.90
Ash	.71
Albuminoids	1.58
Fiber	4.87
Nitrogen-free extract	21.24
Fat	1.71
	100.00

10. *Cranberry Vines.*

Moisture at 100° C.	13.07	Phosphoric acid	.268
Nitrogen	.77	Magnesium oxide	.253
Ash constituents	2.45	Sodium oxide	.080
Ferric oxide	.087	Potassium oxide	.329
Calcium oxide	.404	Insoluble matter	.834

11. *Corn Fodder.*

Moisture at 100° C.	24.87	Potassium oxide	1.465
Nitrogen	.995	Sodium oxide	.794
Phosphoric acid	.201	Ferric oxide	.026
Calcium oxide	.310	Insoluble matter	1.318
Magnesium oxide	.093		

12. *Corn Kernel, New.*

Water	20.00
Ash	1.25
Albuminoids	8.06
Fiber	1.54
Nitrogen-free extract	65.38
Fat	3.77
	100.00

13. *Pea-straw.*

Potash	4.73
Lime	54.91
Magnesia	6.88
Oxide of iron	0.40

Analyses, continued.

Oxide of manganese	0.15
Phosphoric acid	4.83
Sulphuric acid	6.77
Chlorine	0.09
Alumina	1.21
Silica	20.03
	100.00

14. *Peas.*

Potash	36.05
Soda	7.42
Lime	5.29
Magnesia	18.46
Oxide of iron	0.99
Phosphoric acid	33.29
Sulphuric acid	4.36
Chloride of sodium	3.13
Silica	0.51
	100.00

15. *Beet, Egyptian Turnip.*

Moisture at 100° C.	85.80	Magnesium oxide	.035
Nitrogen	.177	Sodium oxide	.061
Phosphoric acid	.070	Ferric oxide	.002
Potassium oxide	.303	Insoluble matter	.018
Calcium oxide	.049		

16. *Carrots.*

Moisture at 100° C.	90.02	Potassium oxide	0.54
Ferric oxide	0.01	Sodium oxide	0.11
Phosphoric acid	0.10	Nitrogen	0.14
Magnesium oxide	0.02	Insoluble matter	0.01
Calcium oxide	0.07		

17. *Turnip, Ruta-baga.*

Moisture at 100° C.	87.23	Phosphoric acid	.136
Nitrogen	.211	Potassium oxide	.546

Analyses, continued.

Calcium oxide	.106	Ferric oxide	.002
Magnesium oxide	.030	Insoluble matter	.001
Sodium oxide	.051		

(*c.*) Analyses of Animal Excrements.

18. *Common Barn-yard Manure, Fresh.*

Water	710.0	Lime	5.7
Organic substance	246.0	Magnesia	1.4
Ash	44.1	Phosphoric acid	2.1
Nitrogen	4.5	Sulphuric acid	1.2
Potash	5.2	Silica and sand	12.5
Soda	1.5	Chlorine and Fluorine	1.5

19. *Common Barn-yard Manure, Moderately Rotted*

Water	750.0	Lime	7.0
Organic substance	192.0	Magnesia	1.8
Ash	58.0	Phosphoric acid	2.6
Nitrogen	5.0	Sulphuric acid	1.6
Potash	6.3	Silica and Sand	16.8
Soda	1.9	Chlorine and Fluorine	1.9

20. *Common Barn-yard Manure, Thoroughly Rotted.*

Water	790.0	Lime	8.8
Organic substance	145.0	Magnesia	1.8
Ash	65.0	Phosphoric acid	3.0
Nitrogen	5.8	Sulphuric acid	1.3
Potash	5.0	Silica and Sand	17.0
Soda	1.3	Chlorine and Fluorine	1.6

21. *Cattle Feces, Fresh.*

Water	838.0	Lime	3.4
Organic substance	145.0	Magnesia	1.3
Ash	17.2	Phosphoric acid	1.7
Nitrogen	2.9	Sulphuric acid	0.4
Potash	1.0	Silica and Sand	7.2
Soda	0.2	Chlorine and Fluorine	0.2

Analyses, continued.

22. *Cattle Urine, Fresh.*

Water	938.0	Lime	0.1
Organic Substance	35.0	Magnesia	0.4
Ash	27.4	Sulphuric acid	1.3
Nitrogen	5.8	Silica and Sand	0.3
Potash	4.9	Chlorine and Fluorine.	3.8
Soda	6.4		

23. *Horse Feces, Fresh.*

Water	757.0	Lime	1.5
Organic Substance	211.0	Magnesia	1.2
Ash	31.6	Phosphoric acid	3.5
Nitrogen	4.4	Sulphuric acid	0.6
Potash	3.5	Silica and Sand	19.6
Soda	0.6	Chlorine and Fluorine.	0.2

24. *Horse Urine, Fresh.*

Water	901.0	Lime	4.5
Organic Substance	71.0	Magnesia	2.4
Ash	28.0	Sulphuric acid	0.6
Nitrogen	15 5	Silica and Sand	0 8
Potash	15 0	Chlorine and Fluorine.	1.5
Soda	2.5		

25. *Sheep Feces, Fresh.*

Water	655.0	Lime	4.6
Organic Substance	314.0	Magnesia	1.5
Ash	31.1	Phosphoric acid	3.1
Nitrogen	5.5	Sulphuric acid	1.4
Potash	1.5	Silica and Sand	17.5
Soda	1.0	Chlorine and Fluorine.	0.3

26. *Sheep Urine, Fresh.*

Water	872.0	Lime	1.6
Organic Substance	83.0	Magnesia	3.4
Ash	45.2	Phosphoric acid	0.1
Nitrogen	19.5	Sulphuric acid	3.0
Potash	22.6	Silica and Sand	0.1
Soda	5.4	Chlorine and Fluorine.	5.5

Analyses, continued.

27. *Swine Feces, Fresh.*

Water	820.0	Lime	0.9
Organic Substance	150.0	Magnesia	1.0
Ash	30.0	Phosphoric acid	4.1
Nitrogen	6.0	Sulphuric acid	0.4
Potash	2.6	Silica and Sand	15.0
Soda	02.5	Chlorine and Fluorine.	0.3

28. *Swine Urine, Fresh.*

Water	967.0	Soda	2.1
Organic Substance	28.0	Magnesia	0.8
Ash	15.0	Phosphoric acid	0.7
Nitrogen	4.3	Sulphuric acid	0.8
Potash	8.3	Chlorine and Fluorine.	2.3

29. *Human Feces, Fresh.*

Water	772.0	Lime	6.2
Organic Substance	198.0	Magnesia	3.6
Ash	29.9	Phosphoric acid	10.9
Nitrogen	10.0	Sulphuric acid	0.8
Potash	2.5	Silica and Sand	1.9
Soda	1.6	Chlorine and Fluorine	0.4

0. *Human Urine, Fresh.*

Water	963.0	Lime	0.2
Organic Substance	24.0	Magnesia	0.2
Ash	13.5	Phosphoric acid	1.7
Nitrogen	6.0	Sulphuric acid	0.4
Potash	2.0	Chlorine and Fluorine.	5.0
Soda	4.6		

31. *Hen Manure, Fresh.*

Water	560.0	Lime	24.0
Organic Substance	255.0	Magnesia	7.4
Ash	185.0	Phosphoric acid	15.4
Nitrogen	16.3	Sulphuric acid	4.5
Potash	8.5	Silica and Sand	35.2
Soda	1.0		

Analyses, continued.

32. *Geese Manure, Fresh.*

Water	771.0	Lime	8.4
Organic Substance	134.0	Magnesia	2.0
Ash	95.0	Phosphoric acid	5.4
Nitrogen	5.5	Sulphuric acid	1.4
Potash	9.5	Silica and Sand	14.0
Soda	1.3		

33. *Duck Manure, Fresh.*

Water	566.0	Lime	17.0
Organic Substance	262.0	Magnesia	3.5
Ash	172.0	Phosphoric acid	14.0
Nitrogen	10.0	Sulphuric acid	3.5
Potash	6.2	Silica and Sand	28.0
Soda	0.5		

34. *Dove Manure, Fresh.*

Water	519.0	Lime	16.0
Organic Substance	308.0	Magnesia	5.0
Ash	173.0	Phosphoric acid	17.8
Nitrogen	17.6	Sulphuric acid	3.3
Potash	10.0	Silica and Sand	20.2
Soda	0.7		

(*d.*) Analyses of Various Materials which are used for Fertilizers.

35. *Peruvian Guano.*

Moisture at 100° C.	12.17	Potassium oxide	3.46
Total phosphoric acid	18.45	Total nitrogen	5.13
Soluble phosphoric acid	1.54	Actual ammonia	3.94
Reverted phosphoric acid	5.92	Organic nitrogen	0.86
Insoluble phosphoric acid	10.99	Nitrogen as nitric acid	0.33
		Insoluble matter	13.64

Analyses, continued.

36. *Oak Leaves.*

Moisture at 100° C...	9.601	Potassium oxide	0.549
Organic matter	83.360	Phosphoric acid.....	0.058
Mineral matter	6.840	Nitrogen	0.930
Ferric oxide	0.027	Soluble silica	0.018
Calcium oxide	0.548	Insoluble silica	4.333
Magnesium oxide	0.267		

37. *Sea Weed.* (Two samples.)

	I.	II.
Moisture at 100° C.....	12.05	14.96
Nitrogen	1.66	1.28
Phosphoric acid.....	.44	.17
Potassium oxide.....	3.81	.36
Calcium oxide	2.73	3.86
Magnesium oxide	1.48	1.30
Sodium oxide.....	11.75	8.40
Chlorine	6.40	5.28
Insoluble matter	7.73	.78

38. *Tobacco Stems.*

Water	13.47
Organic and volatile matters (containing nitrogen 1.93)	70.85
Ash (containing phosphoric acid .53)	15.68
	100.00

39. *Dissolved Bone-Black.*

This material is a superphosphate prepared by treating refuse bone-black from sugar refineries with oil of vitriol, which renders nearly all of the phosphoric acid soluble in water.

Soluble phosphoric acid	14.55	Insoluble phosphoric acid	.20
Reverted phosphoric acid	2.39		

40. *Bone-Black.*

Moisture at 100° C....	5.04	Phosphoric acid	16.56
Ash.....	67.43	Insoluble matter.....	.37

Analyses, continued.

41. *Bone Charcoal.*

Moisture at 100° C...	18.16	Reverted phosphoric acid	5.18
Ash.....	72.24	Insoluble phosphoric acid	20.02
Total phosphoric acid	25.58	Insoluble matter.....	.69
Soluble phosphoric acid	.38		

42. *Ground Bones.* (Two samples.)

	I.	II.
Moisture at 100° C.....	3.97	12.43
Ash.....	49.35	64.21
Total phosphoric acid	19.49	25.67
Reverted phosphoric acid.....	3.80	6.20
Insoluble phosphoric acid.....	15.69	19.34
Nitrogen	4.04	2.68
Insoluble matter	0.78	0.42

43. *Dried Blood.*

Moisture.....	15.02	Nitrogen	8.24

44. *Dry Ground Fish*

Moisture at 100° C.....	8.34
Ash.....	37.76
Total phosphoric acid.....	8.23
Soluble phosphoric acid	.10
Reverted phosphoric acid.....	3.81
Insoluble phosphoric acid	4.32
Nitrogen	6.81
Insoluble matter.....	.82

45. *Sulphate of Ammonia.*

This article, now manufactured on a large scale as a by-product of gas-works, usually contains over 20 per cent. of nitrogen, the equivalent of from 94 to 97 per cent. of sulphate of ammonia. The rest is chiefly moisture.

Nitrogen	20.02	Equivalent ammonia .	24.30

Analyses, continued.

46. *Sulphate of Potash.* (Two samples.)

The double sulphate of potash and magnesia is usually sold as "sulphate of potash."

	I.	II.
Actual potash	27.76	51.28
Equivalent sulphate of potash	51.3	94.8

47. *Sulphate of Magnesia.*

Moisture at 100° C.	29.01	Sulphuric acid	30.35
Magnesium oxide	15.87	Insoluble matter	6.29

48. *Nitrate of Soda.*

Nitrate of soda is mined in Chili and purified there before shipment. It usually contains about 16 per cent. of nitrogen, equivalent to 97 per cent. of pure nitrate of soda. It contains besides, a little salt and some moisture.

Moisture	.35	Sulphate of soda	.21
Salt (sodium chloride)	.23	Pure nitrate of soda	99.21

49. *Muriate of Potash.* (Two samples.)

Commercial muriate of potash consists of about 80 per cent. of muriate of potash (potassium chloride); 15 per cent. or more of common salt (sodium chloride), and 4 per cent. or more of water.

	I.	II.
Actual potash	50.0	52.82
Equivalent muriate	79.2	83.7

50. *German Potash Salts—Average of 11 Analyses.*

Moisture at 100° C.	13.14	Magnesium oxide	9.25
Potassium oxide	21.63	Sulphuric acid	10.85
Sodium oxide	13.76	Chlorine	35.63
Calcium oxide	.85	Insoluble matter	2.08

Analyses, continued.

51. *Kainit—Average of 3 Analyses.*

Moisture at 100° C	9.26	Magnesium oxide	8.97
Potassium oxide	14.04	Sulphuric acid	21.05
Sodium oxide	21.38	Chlorine	32.38
Calcium oxide	1.12	Insoluble matter	.89

52. *Land Plaster or Gypsum.*

Hydrated sulphate of lime	74.88
Matters insoluble in acid	1.28
Moisture	1.18
Other matters, chiefly carbonate of lime	22.66

53. *Ashes, Wood, Unleached.*

Moisture at 100° C	15.72
Calcium oxide	28.61
Magnesium oxide	3.00
Ferric oxide	1.03
Potassium oxide	8.72
Phosphoric acid	0.32
Insoluble matter, before calcination	18.49
" after "	12.12

54. *Ashes, Wood, Leached.*

Moisture at 100° C	13.72
Calcium oxide	48.07
Magnesium oxide	6.06
Ferric oxide	0.68
Potassium oxide	1.92
Phosphoric acid	1.79
Insoluble matter, before calcination	5.49
" after "	2.57

55. *Coal-ashes, Bituminous*

Water	5.0	Soda	0.4
Organic substance	5.0	Magnesia	3.2
Ash	95.0	Phosphoric acid	0.2
Potash	0.4	Sulphuric acid	8.5

Analyses, continued.

56. *Coal-ashes, Anthracite.*

Water	5.0	Soda	0.1
Organic Substance	5.0	Magnesia	3.0
Ash	90.0	Phosphoric acid	0.1
Potash	0.1	Sulphuric acid	5.0

57. *Gas Lime—Average of 4 Analyses*

Moisture at 100° C	22.28	Sulphuric acid*	20.73
Calcium oxide	42.66	Insoluble matter	6.05
Magnesium oxide	8.30		

*Sulphuric acid includes all forms of sulphur present.

(*e.*) TRADE VALUES FOR 1889 OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS. ADOPTED BY EXPERIMENT STATIONS OF MASS., NEW JERSEY, PENN. AND CONN.

	Cts. per lb.
Nitrogen in ammonia salts	19
" nitrates	17
Organic nitrogen in dry and fine ground fish, meat and blood	19
" " cotton seed meal and castor-pomace	15
" " fine bone and tankage	16½
" " fine medium bone and tankage	13
" " medium bone and tankage	10½
" " coarser bone and tankage	8½
" " in hair, horn shavings and coarse fish scrap	8
Phosphoric acid, soluble in water	8
" " ammonium citrate	7½
" " dry ground fish, fine bone and tankage	7
" " fine-medium bone and tankage	6
" " medium bone and tankage	5
" " coarser bone and tankage	4
" " fine ground rock phosphate	2

Analyses, continued.

Potash as high-grade Sulphate and in forms free from Muriate (or Chlorides) 6
" kainit 4½
" muriate 4½

CHAPTER XXI.

Names and Histories.

1. Vegetables which have different Names in England and America.

In America.	*In England.*
Artichoke (*Helianthus tuberosus*)	Jerusalem artichoke,
Bean	Kidney bean, or French bean.
Beet	Beet-root.
Lima bean	Lima kidney bean.
Musk melon	Melon.
Parsnip	Parsnep, in many old books.
Pepper	Capsicum.
Pumpkin	Vegetable marrow. Gourd.
Ruta-baga	Turnip-rooted cabbage. Swedish turnip.
Salsify	Salsafy.
Squash	Pumpkin. Gourd.
" Scallop	Custard marrow.
" Winter Crookneck	Muskmelon, rarely.
Swiss chard	Leaf beet.
Turnip	Turnep in many old books.

3. Names of Fruits and Vege

English.	*French.*	*German.*
Almond	Amandier	Mandel
Apple	Pommier	Apfel
Apricot	Abricotier	Aprikose
Artichoke	Artichaut	Artischöke
Asparagus	Asperge	Spargel
Banana	Banavier	Pisang
Bean, Broad	Fève de Marais	Grosse Bohne and Garten Bohne
Bean, Kidney	Haricot	Türcksche Bohne
Beet	Betterave	Rothe Rübe
Berberry	Épine vinette	Berberitzenstrauch
Black Currant	Cassis and Groseille noir	Schwartze Johannisbeere
Borecole	Chou vert, or Non pommé	Grüner Kohl
Broccoli	Broccoli and Chau brocolis	Italienischer Kohl
Brussels Sprouts	Chou de Bruxelles or à jets	Sprossen Kohl
Cabbage	Chou pommé or Cabus	Kopfkohl
Cardoon	Cardon	Kardon
Carrot	Carotte	Möhre or Gelbe Rübe
Cauliflower	Chou-fleur	Blumen Kohl
Celery	Céleri	Sellerie
Cherry	Cerisier	Kirsche
Chicory or Succory	Chicorée Sauvage	Gemeine Cichorie
Cress, Garden	Cresson	Gemeine Garten Kresse
" Water	Cresson de Fontaine	Brünnen Kresse
" Winter	Cresson de Terre	Winter Kresse
Cucumber	Concombre	Gurke
Egg-plant	Melongène, Aubergine	Tollapfel and Eierpflanze
Endive	Chicorée des Jardins, Endive	Endivie
Fig	Figuier	Feige
Filbert	Noisette	Nussbaum
Garlic	Ail	Knoblauch
Gooseberry	Groseiller à Maquereau	Stachelbeere
Grape	Vigne	Traube and Weintrauben
Horse-radish	Cranson or le Grand Raifort	Meerrettig
Kohl-rabi or Turnip-cabbage	Chou-rave	Kohl Rabi
Leek	Poireau	Gemeiner Lauch or Porro Zwiebe
Lemon	Limonier	Limonie
Lettuce	Laitue	Gartensalat and Lattich
Melon, Musk	Melon	Melone

Tables in Various Languages.

Dutch.	*Italian.*	*Spanish.*
Amandelboom	Mandorlo	Almendro.
Appelboom	Melo or Pomo	Manzana.
Abrikozenboom	Albicocco	Albaricoque.
Artisjok	Cacìofo	Cinauco.
Aspergie	Asparago or Sparagio	Esparrago.
Bananenboom.		
Boon	Fava	Haba.
Turksche Boon	Faginolo	Judias and Fasoles.
Beetwortel or Karoot	Barba bietola	Betarraga.
Barbarisse	Berbero	Berberis.
Aalbessenboom	Ribes nero	Grosella negro.
Gröne Kool	Cavolo aperto	Col.
Scotsche Kool	Broccoli	Broculi.
Spruit Kool.		
Kool	Cavolo	Berza.
Spaansche Artisjok	Cardon	Cardo.
Gerle Wortel	Carota	Chirivia.
Bloem Kool	Cavoli fiori	Berza florida.
Selderij	Appio	Appio hortense.
Keresenboom	Ciriegia	Cerezo.
Suikerei	Cicoria	Achicoria.
Tuinkers	Cresciio	Mastuerzo.
Waterkers	Crescione di Sorgenti	Berro.
Winterkers	Erba di Santa Barbarea	Hierba de Santa Barbara.
Komkommer	Citriuolo	Pepino or Cohombro.
Dolappel	Melanza	Berengena.
Andijvie	Indivia	Endivia.
Vijgenboom	Fico	Higuera.
Hazelnotenboom	Avellano	Avellano.
Knoflook	Aglio	Ajo.
Kruisbessenboom	Uva-spina	Uva-crespas.
Druif	Vigna	Vina.
Rammenas	Ramolaccio	Rabano picante.
Look or Prei	Porro	Puerro.
Limoenboom	Limoen	Limon.
Latouw	Lattuga	Lechuga.
Meloen	Mellone and Popone	Melon.

Names of Fruits and Vegetables in

English.	*French.*	*German.*
Mint, common	Menthe des jardins	Munze
Mulberry	Mûrier	Maulbeere
Mushroom	Champignon comestible	Essbare Blätterschwamme
Mustard	Moutarde	Senf
Nectarine	Pêche lisse	Nectarpfirsch
Olive	Olivier	Oelbaum and Olive
Onion	Oignon	Zwiebel
Orange	Oranger	Pomeranze
Orach	Arroche	Meldekraut
Parsley	Persil	Petersilie
Parsnip	Panais	Pastinake
Pea	Pois	Erbse
Peach	Pêcher	Pfirsiche
Pear	Poirier	Birne
Pepper	Piment	Spanischer Pfeffer
Pine-apple	Ananas	Ananas
Plum	Prunier	Pflaume
Pomegranate	Grenadier	Granatenbaum
Potato	Pomme de Terre	Kartoffel
Pumpkin or Gourd	Courge	Kürbis
Quince	Coignassier	Quitte
Radish	Radis and Rave	Rettig and Radies
Rape	Navette	Repskohl
Red Currant	Groseiller commun	Gemeine Johannisbeere
Rhubarb	Rhubarbe	Rhabarber
Sage	Sauge	Salbey
Salsify	Salsifis	Haferwurzel and Bocksbart
Savoy	Chou de Milan or pommé fraisé	Wirsing or Herzkohl
Sea-kale	Chou marin and Crambé	Meerkohl
Spinach	Épinard	Spinat
Strawberry	Fraisier	Erdbeer
Sweet Chestnut	Châtaignier and Marronier	Castanien
Thyme	Thym	Thimian
Tomato	Tomate	Liebesapfel
Turnip	Navet	Rübe
Walnut	Noyer	Wallnuss
White Currant	Groseiller commun	Gemeine Johannisbeere
Watermelon	Me'on d'Eau	Wassermelone

Various Languages, continued.

Dutch.	*Italian.*	*Spanish.*
Munt	Erba Sta. Maria	Menta.
Moerbezieboom	Moro	Moral.
Kampernoelio	Pratajuolo bianco	Seta.
Mosterd	Senapa	Mostaza.
Kale Perzik	Brugnuolo	Especie de Durazno.
Olijfboom	Ulivo	Olivo.
Uijen	Cipolla	Cebolla.
Oranjeboom	Arancio	Naranja.
Melde	Atreplice	Armuelle.
Pieterselie	Petroseline	Perejil.
Pinksternakel	Pastinaca	Chirivia and Pastinaca.
Erwt	Pisello	Guisante.
Perzikboom	Persico	Alberchigo
Perenboom	Pero	Pera
Spaansche Peper	Peberone	Pimiento.
Ananas	Ananas	Pina
Pruinboom	Prungo	Ciruelo.
Granaatboom	Melagrano	Granada.
Aardappel	Tartufi bianchi or Pomo di Terra	Batatas Inglezas.
Kauwörde	Zucca	Calabaza.
Kweeboom	Cotogno	Membrillo.
Radijs	Rafano	Rabano.
Rapskool	Nape salvatico	Naba silvestre.
Aalbessenboom	Ribes rosso	Grosella.
Rabarber	Rabarbaro	Ruibarbo.
Salie	Salvia	Salvia.
Boksbaard	Sassifica	Barba Cabruna
Savojie Kool	Cappuccio	Berza de Saboya.
Zeekool	Crambe marina	Col marina.
Spinazie	Spinace	Espinaca.
Aardbeziënplant	Piantadifragola	Fresa.
Kastanjeboom	Castagno	Castano.
Gemeene Thyne	Timo	Tomillo.
Appeltjes der liefde and Tomaat	Pomo d'Oro	Tomate
Raap	Navone	Nabo.
Walnotenboom	Noce	Noguera.
Aalbessenboom	Ribes rosso	Grosella.
		Sandia.

3. Derivation of the Names of Various Fruits and Vegetables.

a. Fruits.

Apple.—Anglo-Saxon, *æppel.*

Apricot.—Indirectly from Latin *præcox*, early.

Blackberry.—From the color of the fruit

Cherry.—Anglo-Saxon, *cirse.*

Cranberry.—Crane-berry, from the slender pedicel of the European species.

Currant.—Corruption of Corinth, Greece, whence came the "dried currants" (grapes), which were once called Corinths.

Gooseberry.—Gorse-berry, because the fruit is often rough like the gorse, a European plant.

Grape.—French, *grappe;* allied to the word grapple.

Lemon.—French, *limon.*

Mulberry.—German, *mulber*, indirectly from Latin *morus*, a mulberry tree.

Nectarine.—Nectar-like.

Orange.—Latin, *aurum*, gold.

Peach.—Corruption of Persia, whence the fruit was early obtained.

Pear.—*Pirum*, the Latin name.

Plum.—Anglo-Saxon, *pluma;* indirectly from Latin *prunum*, a plum.

Quince.—Corruption of *Cydonia*, the Latin name, from Cydon.

Raspberry.—From *rasp*, referring to the character of the plant.

Strawberry.—In early times the berries were strung on straws when sold.

b. Vegetables.

Artichoke.—Italian, *articiocco;* indirectly from Arabic.

Asparagus.—The Latin name.

Derivation of the Names of Fruits and Vegetables, continued.

Bean.—The Anglo-Saxon name.

Beet.—Latin, *beta*, the beet plant.

Cabbage.—French, *cabus*, from the Latin *caput*, a head.

Carrot.—French, *carotte*, from Latin *carota*, the carrot.

Brussels Sprouts.—From Brussels, Belgium.

Cauliflower.—Latin, *caulis*, stem, and *flower*.

Celery.—Latin, *selinon*, parsley.

Chervil.—Anglo-Saxon, *cerfille*, indirectly from a Greek combination signifying "pleasant leaf."

Chives or **Cives.**—Latin, *cepa*, onion.

Corn.—Anglo-Saxon, *corn*.

Cress.—Old German, *kresan*, to creep.

Cucumber.—Latin, *cucumis*.

Egg-plant.—From the egg-shaped fruit of some varieties.

Endive.—French, *endive*, indirectly from the Latin *intubus*, the endive or chicory.

Garlic.—Anglo-Saxon, *gar* and *leak*, spear-leaf, referring to the shape and position of the leaves.

Gumbo.—Portuguese, *quingombo*, from *quillobo*, an African name.

Horse-radish.—Refers, evidently, to the strong and pungent character of the roots by reference to the strength of the horse.

Kohl-rabi.—Corruption of the Latin *caulo-rapa*, stem-turnip.

Leek.—Anglo-Saxon, *leac* or *leak*.

Lettuce.—Latin, *lactuca*, the lettuce: from *lac*, milk, referring to the milky juice of the plant.

Melon.—Latin, *melo*, a certain small melon.

Mushroom.—French, *mousseron*, alluding to *mousse*, or moss, in which some mushrooms grow.

Mustard.—French, *moustarde*, from Latin *mustum*, the must, with which mustard was mixed.

Derivation of the Names of Fruits and Vegetables, continued.

Onion.—French, *oignon;* indirectly from Latin *unus*, one, *unis*, oneness, in allusion to a plant of which the bulb was formed of one piece.

Parsley.—From a Greek combination meaning "rock-parsley," a parsley-like plant.

Parsnip.—Latin, *pastinaca.*

Pea.—French, *pois*, evidently from Latin *pisum*, the pea.

Pepper.—Latin, *piper*, the true pepper or black pepper, with which the present plant is compared in pungency.

Potato.—Spanish and Portuguese, *batata*, probably an aboriginal American name. First applied to the sweet potato.

Pumpkin.—French, *pompion*, from Latin *pepo*, a pumpkin-like fruit.

Radish.—Latin, *radix*, root.

Rhubarb.—French, *rhubarbe;* probably indirectly from Latin *barbarus*, foreign.

Sage.—Latin, *salvus*, saved, evidently in allusion to medicinal properties of the plant.

Salsify.—French, *salsifis.*

Spinach or **Spinage.**—Latin, *spinacia*, spinach, from *spina*, a thorn, in reference to the prickly character of the plant.

Squash.—American Indian, *asquash*, a raw or green fruit.

Tomato.—*Tomate*, of South American origin.

Turnip.—Probably Welsh *turn*, round, and *maip*, turnip.

4. Periods of Cultivation and Native Countries of Cultivated Plants.

(Adapted from researches of De Candolle, and Gray and Trumbull.)

Almond. Over 4,000 years; Mediterranean basin, western temperate Asia.

Apple. Over 4,000 years; Europe, Anatolia, south of the Caucasus.

Periods of Cultivation and Native Countries of Plants, continued.

Apricot. Over 4,000 years ; China.

Artichoke. Less than 2,000 years ; Europe, Africa, Canaries and Madeira.

Asparagus. Over 2,000 years ; Europe, western temperate Asia.

Banana. Over 4,000 years ; Southern Asia.

Barley, common. (?); Western temperate Africa.

Bean, Kidney. Over 4,000 years ; unknown wild. Probably N. American.

Bean, Broad. Over 4,000 years; South of the Caspian (?).

Buckwheat. Less than 2,000 years ; Mandschuria, Central Siberia.

Buckwheat, Tartarian. Less than 2,000 years ; Tartary Siberia to Dahuria.

Cabbage. Over 4,000 years ; Europe.

Carrot. Over 2,000 years ; Europe, western temperate Asia (?).

Celery. Over 2,000 years ; Europe, Asia and Africa.

Chestnut. (?) ; from Portugal to Caspian Sea, eastern Algeria.

Chives. Less than 2,000 years ; temperate and northern Europe.

Citron. Over 2,000 years ; India.

Corn Salad. Less than 2,000 years ; Sardinia, Sicily.

Cotton, Herbaceous. Over 2,000 years ; India.

Cress. Over 2,000 years ; Persia (?).

Cucumber. Over 4,000 years ; India.

Currant, black. Less than 2,000 years ; Europe, western Himalayas.

Currant, red. Less than 2,000 years ; Europe, to Himalayas ; north of U. S.

Date-palm. Over 4,000 years ; Western Asia and Africa.

Egg-plant. Over 4,000 years ; India.

Periods of Cultivation and Native Countries of Plants, continued.

Endive. Less than 2,000 years; Mediterranean basin.

Fig. Over 4,000 years; South of Mediterranean basin.

Garlic. Over 2,000 years; desert of the Kirghis.

Gooseberry. Less than 2,000 years; temperate Europe, western Himalayas.

Hop. Less than 2,000 years; Europe, Asia, U. S.

Horseradish. Less than 2,000 years; Eastern temperate Europe.

Jerusalem Artichoke. Probably ancient; U. S.

Leek. Over 2,000 years; Mediterranean basin.

Lettuce. Over 2,000 years; Europe, Asia and Africa.

Maize. Very ancient; New Granada (?)

Melon. Less than 2,000 years; India, Beluchistan, Guinea

Mushroom. Less than 2,000 years; Northern hemisphere.

Oats. Over 2,000 years; temperate Europe.

Okra. Less than 2,000 years; tropical Africa.

Onion. Over 4,000 years; Persia, Afghanistan, Beluchistan, Palestine (?).

Onion, Welsh. Less than 2,000 years; Siberia.

Orach. Less than 2,000 years; Northern Europe and Siberia.

Parsley. Lesss than 2,000 years; Europe, Algeria and Lebanon.

Parsnip. Less than 2,000 years; Central and Southern Europe.

Pea. Over 2,000 years; Caucasus to Persia (?), India (?).

Peach. Over 4,000 years, China.

Pear. Over 4,000 years; temperate Europe and Asia.

Pepper. Over 500 years; Brazil (?).

Pine-apple. Over 500 years; Mexico, Central America.

Plum. Over 2,000 years; Anatolia, North of Persia.

Potato. Over 500 years; Chili, Peru.

Periods of Cultivation and Native Countries of Plants, continued.

Pumpkin and Squash. Over 500 years; temperate N. America.

Quince. Over 4,000 years; North of Persia, south of the Caucasus, Anatolia.

Radish. Over 2,000 years; temperate Asia.

Rampion. Less than 2,000 years; temperate and southern Europe.

Rape. Over 4,000 years; Europe, Western Siberia (?).

Rice. Over 4,000 years; India, southern China (?).

Rye. Over 2,000 years; Eastern temperate Europe (?), South-east of Europe, Algeria.

Salsify. Less than 2,000 years (?); south-east of Europe, Algeria.

Sea Kale. Less than 2,000 years; Western temperate Europe.

Scorzonera. Less than 2,000 years; South-west of Europe.

Shaddock. Over 2,000 years; Pacific Islands.

Shallot. Less than 2,000 years; unknown wild.

Spinach. Less than 2,000 years; Persia (?).

Sorghum. Over 4,000 years; tropical Africa (?).

Strawberry, Chili. Less than 300 years; Chili.

Strawberry, Virginia. Less than 300 years; temperate N. America

Sunflower. Very ancient; U. S.

Sweet Potato. Very ancient; tropical America.

Tomato. Over 500 years; Peru.

Turnip. Over 4,000 years; Europe, western Siberia (?).

Watermelon. Over 4,000 years; tropical Africa.

Wheat. Over 4,000 years; region of the Euphrates.

CHAPTER XXII.

STATISTICS.

1. Horticultural Statistics.

1. EXPORT OF FRUITS FOR 1886.

Article.	*Quantity.*	*Value.*
Apples, dried	10,473,183 lbs.	$548,434
Apples, green or ripe	744,539 bbl.	1,810,606
Preserved—canned	.....	580,422
other	.....	28,339
all other	.....	340,507

2. EXPORTS OF FRUITS FOR 1887.

Articles	*Quantities.*	*Value.*
Apples, dried	8,130,896 lbs.	$413,363
Apples, green or ripe	591,868 bbl.	1,382,872
Fruits preserved, canned	.....	506,794
Other preserved	.....	29,489
All other, green, ripe or dry	.....	337,447

3. EXPORTS OF FRUITS AND NUTS FOR 1888.

Articles.	*Quantity.*	*Value.*
Apples, dried	11,803,161 lbs.	$812,682
Apples, green	489,570 bbl.	1,878,801
Preserved, canned	.....	834,668
Other preserved	.....	58,630
All other, green, ripe or dried	.....	397,643
Nuts	.....	27,784

Horticultural Statistics, continued.

4. EXPORTS OF VEGETABLES FOR 1886.

Articles.	*Quantities.*	*Value.*
Onions	68,811 bus.	$75,838
Peas and beans	408,318 "	570,153
Potatoes	494,948 "	346,864
Vegetables canned	.....	190 389
All other, including pickles	.....	134,293

5. EXPORTS OF VEGETABLES FOR 1887.

Articles.	*Quantities.*	*Value.*
Onions	71,689 bus.	$73,515
Peas and beans	387,222 "	562.864
Potatoes	434,864 "	318,259
Vegetables canned	.....	228,567
All other, including pickles	.....	125,448

6. EXPORT OF VEGETABLES FOR 1888.

Articles.	*Quantities.*	*Value.*
Onions	56,725 bus.	$64,161
Peas and beans	253,170 "	462,762
Potatoes	403,880 "	308,193
Vegetables canned	.....	265,587
All other	.....	140,634

7. IMPORTS OF FRUITS, NUTS AND VEGETABLES FOR 1887 AND 1888.

Articles.	*1887.*	*1888.*
Fruits and nuts	$20,608,486	$20,502,223
Beans and peas	607,853	2,190,137
Potatoes	543 091	3,698,021
Pickles and sauces	387,177	416,958
All other in natural state, salt or brine	516,319	715,063
Prepared or preserved	295,911	350,245

Horticultural Statistics, continued.

8. Imports of Vegetables for 1886 and 1887.

Articles.	*1886.*	*1887.*
Beans and peas	$585,461	$607,853
Potatoes	649,009	543,091
Pickles and sauces	323,362	387,177
All other, in their natural state or in salt or brine	528,830	516,319
Prepared or preserved	465,517	295,911

9. Total Agricultural Exports and Imports for 1887 and 1888.

	1887.	*1888.*
Total agricultural exports	$520,820,758	$498,966,029
Total exports of domestic manufacture	703,022,923	683,862,104
Per cent. of agricultural matter.	74	73
Total imports of agricultural products	287,542,266	318,502,085

10. Value of Orchard and Market Garden Products in the Various States in 1879. (Tenth Census.)

State.	*All orchard products consumed or sold.*	*Market garden products sold.*
Alabama	$362,263	$135,127
Arizona	5,530	17,272
Arkansas	867,426	62,007
California	2,017,314	796,663
Colorado	3,246	136,617
Connecticut	456,246	385,014
Dakota	156	40,473
Delaware	846,692	166,575
District of Columbia	12,074	202,191
Florida	758,295	154,002
Georgia	782,972	158,490
Idaho	23,147	36,025
Illinois	3,502,583	959,962
Indiana	2,757,359	578,413
Iowa	1,494,365	401,928
Kansas	358,860	279,448

Horticultural Statistics, continued.

	All orchard products consumed or sold.	*Market garden products sold.*
Kentucky	1,377,670	592,411
Louisiana	188,604	132,525
Maine	1,112,026	144,892
Maryland	1,563,188	873,968
Massachusetts	1,005,303	1,696,890
Michigan	2,760,677	636,908
Minnesota	121,648	166,030
Mississippi	378,145	48,650
Missouri	1,812,873	763,439
Montana	1,530	41,020
Nebraska	72,244	152,545
Nevada	3,619	75,847
New Hampshire	972,291	115,967
New Jersey	860,090	1,841,863
New Mexico	26,706	42,679
New York	8,409,794	4,211,642
North Carolina	903,513	135,435
Ohio	3,576,242	1,486,787
Oregon	583,663	168,935
Pennsylvania	4,862,826	1,752,934
Rhode Island	58,751	261,938
South Carolina	78,934	84,363
Tennessee	919,844	228,269
Texas	876,844	277,023
Utah	148,493	37,851
Vermont	640,942	38,966
Virginia	1,609,663	837,609
Washington	127,668	27,918
West Virginia	934,400	162,898
Wisconsin	639,435	206,691
Wyoming	.....	6,150

11. Total Exports of Apples from the United States and Canada in Various Years

	Barrels.		*Barrels.*
1888–89	1,401,382	1883–84	81,532
1887–88	608,588	1882–83	395,594
1886–87	811,410	1881–82	239,252
1885–86	893,375	1880–81	1,328,806
1884–85	787,785		

Horticultural Statistics, continued.

12. Details of Apple Exportations for Three Seasons

From	To Liverpool	Glasgow.	London.	Various.	Total. 1888–89	1887–88	1886–87
Boston	294,374	46,611	30,715	8,475	380,175	164,268	306,693
New York	239,106	123,341	61,910	57,399	481,756	269,943	175,771
Montreal	116,742	100,106	69,750	5,094	291,692	93,134	106,703
Portland	143,198	.....	.....	320	143,518	23,604	102,764
Halifax	.....	.....	95,122	.....	95,122	39,768	97,474
Annapolis	.....	.....	9,119	.....	9,119	17,871	22,005
Total, 1888–89	793,420	270,058	266,616	71,288	1,401,382	.....	.....
Total, 1887–88	343,302	138,945	109,875	16,466	.....	608,588	.....
Total, 1886–87	470,757	142,188	185,688	12,777	.....	.....	811,410

Horticultural Statistics, continued.

13. IMPORTATION OF APPLES INTO ENGLAND.

The commercial importation of apples to England began about 20 years ago. The following table shows the total importations into England and also those from the United States. England draws her foreign apple supply from the United States, Canada, Belgium, Holland and France.

	TOTAL IMPORTATIONS.		IMPORTATIONS FROM UNITED STATES.	
	Bushels.	Value in pounds.	Bushels.	Value in pounds.
1883	2,251,925	£553,488	273,825	£126,219
1884	2,679,800	786,415	976,269	349,168
1885	2,387,685	717,031	1,349,798	440,925
1886	3,261,460	857,095	1,647,052	478,895
1887	1,944,460	563,919	997,413	295,108

14. IMPORTATIONS OF BANANAS.

1884	$1,878,279	
1885	2,156,873	
1886	2,356,843	
1887	2,682,143 =	5,914,472 bunches
1888	3,153,645 =	8,049,074 "

The first bananas introduced into this country were brought from Cuba to New York in 1804. The first full cargo (1,500 bunches) arrived in 1830.

15. GOVERNMENT AIDS TO HORTICULTURE

CALIFORNIA.—Viticulture	$15,000 00
Horticulture	10,000 00
Forestry	2,500 00
Experimental and analytical work	5,000 00
Total	$32,500 00

Horticultural Statistics, continued.

COLORADO.—Reports published.
DAKOTA.—Appropriations to college.

ILLINOIS	$2,000 00
INDIANA	500 00
IOWA.—5,000 reports published and	1,000 00
KANSAS.—8,000 reports published.	
MAINE	500 00
MICHIGAN.—8,400 copies annual report published and	1,000 00
MINNESOTA.—Horticulture	1,750 00
Horticultural Experimental Station	1,000 00
Publishes 3,500 copies of 500-page report.	
MISSOURI.—Reports printed and	1,250 00
NEBRASKA.—Reports published and	1,000 00
NEW HAMPSHIRE	100 00
NORTH CAROLINA	500 00
OHIO.—Reports published and	1,000 00
PENNSYLVANIA.—Reports published.	
WISCONSIN.—Reports published and	1,000 00
CANADA—NOVA SCOTIA.—Reports printed and	300 00
QUEBEC	2,000 00
ONTARIO	1,000 00

16. TARIFFS ON CERTAIN PRODUCTS.

Oranges and Lemons	16.54 per cent.
Dates	30.00 "
Vegetables	27.23 "
Peanuts	63.00 "
Hops	49.50 "
Oats	26.00 "
Honey	55.55 "
Cheese	29.57 "
Butter	25.18 "
Wool	37.16 "

Horticultural Statistics, continued.

17. Miscellaneous.

In 1888, between 200 and 300 tons of dried pyrethrum flowers—for Persian insect powder—were imported into this country. California produced about 50 tons.

The Florida orange crop was estimated at 2,000,000 boxes in 1888. In 1889 it is estimated that 1,600,000 boxes.

The estimated yield of cranberries in 1888 was 585,000 bushels, of which New England produced 260,000, New Jersey, 225,000 and the West 100,000. The estimates for 1889 place the New England crop at 22½ per cent. short, the Western crop 37½ per cent. short, and the New Jersey crop 40 per cent. short.

About 20,000,000 cocoanuts come into the New York market every year. They come mostly from Central America.

The "dried currants" of commerce are seedless grapes. They come from Greece. The following figures give an idea of the extent of this industry:

In 1871 ..... 81,800 tons were grown.
In 1878 ..... 101,000 " " "
In 1888 ..... 160,000 " " "

Number and Cost of Experiment Stations.

There are to-day 46, or, counting branch stations, 57 agricultural experiment stations in the United States. Every state has at least 1 station, several have 2, and one has 3. These 46 stations now employ over 870 trained men in the prosecution of experimental inquiry. The appropriation by the United States Government for the fiscal year just ended, 1889, for them and for the office of experiment stations in the department, is $505,000; for the coming year it is $600,000. The several states appropriate about $125,000 in addition, making the sum total of about $720,000 given from the public funds the present year for the support of agricultural experiment stations in the United States. This is less than 10 cents for each of 7,500,000 farm workers of the country, less than 2½ cents for each of the 30,000,000 of our population directly dependent upon agri-

Horticultural Statistics, continued.

culture for their support, and less than 1¼ cents for each of the 60,000,000 of our people who consume the products of our farms. The farming lands, farm implements and live stock of the country are estimated to be worth $12,000,000,000. The experiment stations cost us, therefore, about $6.25 a year for every million dollars invested in agriculture. Or, reckoning the annual value of the products of our farms at $2,200,000,000, we are now spending about 33⅓ cents for every $1,000 worth of products in an attempt to increase the value of those products in future years.

2. Statistics of the Vegetable Kingdom.

There are 200 natural families or orders of flowering plants, about 7,600 genera, and about 100,000 species are known and described. The flowerless plants are much more numerous than the flowering plants, both in individuals and species. Ferns, moss, mushrooms and many smaller or even microscopic fungi, lichens and sea-weeds are flowerless plants.

The Ranunculaceæ or Crowfoot family includes over 1,200 species of plants, inhabiting all parts of the world. The clematis, marsh-marigold or so-called cowslip, columbine, adonis, buttercup Christmas rose, love-in-the-mist, larkspur, aconite and pæony are members of the Crowfoot family. The family comprises 30 genera.

There about 100 species of clematis known.

About 40 distinct species of delphinium or larkspur are described, few of which are cultivated, however.

It is supposed that there are about a half-dozen true species of pæonies known, although many supposed species have been described.

The Magnolia family comprises about 70 species of trees and shrubs. Of these, 14 are magnolias proper, of which 6 are native of Japan, China or the Himalaya region, and the remainder are North American. The tulip-tree, of which but a single species is known, belongs to this order.

The Nymphæaceæ or Water Lily family contains 8 genera

Statistics of the Vegetable Kingdom, continued.

and about 35 species, all aquatic. The largest genus is nymphæa—by some called castalia—comprising some 20 species.

The Mustard family, Cruciferæ, comprises probably about 2,000 species, many of which are grown for food and ornament. The cabbage, cauliflower, turnip, kohl-rabi, radish, horse-radish, sea-kale, cresses and mustards are the leading edible species, while the stocks, alyssum, wall-flower, honesty or lunaria are among the ornamental species. There are over 175 genera in the order.

The Violet family comprises about 250 species, generally distributed over the world. Of these, about 200 are violets. The order includes 21 genera. Some of the species, outside of viola proper, are shrubs or small trees.

The Caryophyllaceæ or Pink family has about 1,000 species and 35 genera. The ornamental genera are dianthus, including the pinks and carnation, saponaria, silene, lychnis and a few others of less importance. Dianthus, literally "Jove's flower," numbers some 200 species. The corn-cockle and catchflies belong to this family.

The Mallow family, Malvaceæ, has about 60 genera and 700 species. The best known genera are althæa, the hollyhock; malva, the mallows; hibiscus; abutilon; and gossypium, the cotton.

The Basswoods or Lindens are 8 in number, growing in northern temperate climates. Two are natives of North America. Tiliaceæ, the basswood family, comprises 40 genera and about 330 species.

Some 50 species of maples are known, inhabiting Europe, Asia and America. 9 grow naturally in North America. The Sapindaceæ, to which family the maple belongs, is largely tropical. It comprises over 70 genera, and 600 or 700 species. Æsculus, the horse-chestnuts, belong here, and are about 14 in number.

The Leguminosæ or Pulse family, is one of the most important orders of plants. It furnishes many foods, fine woods,

Statistics of the Vegetable Kingdom, continued.

dyes, medicines, and ornamental plants. Many of the species are extremely important in agriculture because of the great amount of nitrogen which they contain. Peas, beans, clover, locusts, acacias, sensitive plant, belong in this family. It comprises about 400 genera and 6,500 species.

The Rosaceæ or Rose family may be called the fruit family of the north temperate zone. Apples, pears, quinces, Juneberries, strawberries, blackberries, raspberries, peaches, plums, apricots, almonds, cherries, all belong here. Prunus, which includes the stone fruits, has about 80 species in various parts of the world, and 11 are North American. Pyrus, including apple, pear, quince and mountain ash, has about 40 species, of which 5 are in North America. Of roses, over 250 have been described, but late authorities consider that there are only about 30 good species. Of strawberries, there are 3 or 4 species, and of spiræa about 50. The whole family has about 1,000 species and 70 genera.

Vitis, the grape and its allies, has some 230 species. There are two or three other genera, and about a score of other species in the family, vitaceæ or ampelideæ, to which it belongs.

The Cucurbitaceæ includes the squashes, pumpkins, cucumbers, melons, and gourds. The species are about 500 in number, and are mostly tropical or sub-tropical. Some 25 species are described as cucumis, to which the cucumber and muskmelon belongs, and 2 as citrullus or watermelon. The pumpkins and squashes belong to cucurbita, of which about 10 species are known, several of them perennials. The family comprises about 70 genera.

About 350 species of Begonia are known.

Of Cacti, there are about 1,000 species and 13 genera, all but one species native of the New World.

Umbelliferæ, comprising over 150 genera and about 1,300 species, includes the parsnip, parsley, carrot, celery, caraway, anise, dill and others. In Africa some of the species attain the size of trees.

Statistics of the Vegetable Kingdom, continued.

About one-ninth of all the flowering plants are comprised in the Compositæ or Sunflower family. It is by far the largest order, containing nearly 800 genera and about 10,000 species. Very few of the species furnish esculent parts; the leading ones are lettuce, endive, chicory, artichoke, cardoon and salsify. But the family comprises great numbers of ornamental plants, of which the leading one at the present time is the chrysanthemum. A very few of the species become small shrubs.

The Heath family, Ericaceæ, includes the heaths, heather of Europe, wintergreen, whortleberries or huckleberries, cranberries, azaleas, rhododendrons and laurels. Certain white and flesh-colored parasitic plants also belong to it, as the Indian pipe and the snow plant of the Rocky Mountains. About 80 genera and over 1,300 species are known.

The Primulas belong to the Primulaceæ or Primrose family, and they number some 80 or more species, many of which are cultivated. The genus primula is commonly divided by florists into auriculas, polyanthuses and primroses. One of the primulas is the true cowslip. Primulaceæ has about 20 genera and 250 species.

Oleaceæ, a family of 18 genera and nearly 300 species, includes the jasmine, forsythias, lilacs, ashes, privet and olive. 10 species of Fraxinus or ash, are native to North America. There are about 120 species of jasminum or jasmine, 2 of forsythia, 6 of syringa or lilac, over 30 of fraxinus, about 25 of ligustrum or privet, and 35 of olea, or olive.

The Convolvulus or Morning-glory family, Convolvulaceæ, has some 800 species, some of which are trees, and 32 genera. The dodders, peculiar parasitic plants, of which several are natives of the United States, belong here, as does also the sweet potato.

There are about 30 species of Phlox described, nearly all natives of North America. The common *Phlox Drummondii* is native of Texas.

Solanaceæ is a large and important order, containing many

Statistics of the Vegetable Kingdom, continued.

esculent plants and many poisons. Here belong the potato, tomato, egg-plant, red pepper, and strawberry or husk tomato; also tobacco, belladonna and nightshade. There are 66 genera and from 1,200 to 1,500 species. The genus solanum alone, to which the potato and egg-plant belong, contains from 700 to 900 species. Lycopersicum, the tomato genus, has less than a half dozen species.

There are about 140 genera and 2,600 species in the Labiatæ or Mint family. The order comprises a few tree-like and a few climbing plants. The species are aromatic, and most of our cultivated sweet herbs, and all the mints, belong to the family. It comprises many ornamental species, among the most prominent being species of coleus, of which about 50 species are described.

The Nettle family or Urticaceæ comprises many dissimilar plants. Here belong the nettles, mulberry, fig, bread-fruit, hack-berry osage-orange, elm, hemp and hop. The family has in the neighborhood of 1,500 species, and the accepted genera are 108. 5 elms and 2 mulberries are native to North America, and 3 wild figs grow in Southern Florida.

Five genera and about 30 species belong to the Juglandaceæ or Walnut family. All the hickories, 8 or 10, are natives of North America. There are 2 walnuts and 1 butternut in the United States.

Cupuliferæ, the Oak family, numbers 400 species and 10 genera. It gives us the oaks, about 300 in the world and 44 in the United States; chestnuts, beeches, hazels and filberts, birches, alder, hornbeam and ironwood. The United States has 2 chestnuts, 1 beech, about 8 birches and 6 alders.

The Pine or Spruce family is known as the Coniferæ, or cone-bearing family. It includes plants of very dissimilar kinds. Most of the species have needle-like and evergreen leaves, but some are deciduous, and the ginkgo has broad and flat leaves. There are some over 30 genera and about 300 species in the family. Of pines there are about 70, and 35 of them are native to the United States.

Statistics of the Vegetable Kingdom, continued.

Orchidaceæ, the Orchid family, includes some 5,000 singular herbs, distributed through 334 genera. Many of the species are epiphytes, that is, growing above ground on other plants. The species are the most specialized, perhaps, of any order, and they are usually uncommon or rare. A number of showy species grow in the United States, the best known of which are the lady-slippers. Our species usually inhabit bogs or deep woods.

Over 2,000 species, in 187 genera, comprise Liliaceæ, or the Lily family. Some of the species are tree-like. Here belong the onion, asparagus, tulip, aloes, yuccas, hellebore, and many choice ornamental plants. Of lilies, there are about 45 species, tulips in the neighborhood of 50, and of hyacinths about 30.

The Palm family, Palmæ, includes 1,100 or more species and 132 genera. Many species produce edible fruits, the best known in our markets being the date and cocoanut.

The Gramineæ or Grass family is the most important order of plants. Besides all the grasses, it furnishes all the cereal grains, including Indian corn and the sugar cane. Genera about 300; species over 3,000.

There are about 74 genera of ferns or Filices, and in the neighborhood of 2,400 species. Some of the species attain to the size of small trees.

CHAPTER XXIII.

Glossary.

Acclimation. The spontaneous or natural process of becoming, or the state or condition of being, inured or habituated to climate at first injurious.

Acclimatization. The act of man in inuring or habituating to a climate at first injurious, or the state or condition of being thus inured or habituated by man.

Adventive. Said of foreign plants which grow spontaneously, but which are not thoroughly established.

Agriculture. The art and science of cultivating land and raising crops and stock. The term is often restricted to include only the cultivation of grains and forage plants and the rearing of domestic animals, with the operations and studies incident thereto.

Alburnum. Sap-wood.

Ammonia. A pungent gas, composed of an atom of nitrogen to three of hydrogen.

Annual (*adj.*). Living for one year only.

Arm. In grape culture, a vine branch over a year old.

Assimilation. In botany, the production of organic matters from inorganic matters.

Bacterium (pl. *bacteria*). As popularly used, the term is applied to an extensive class of microscopic organisms, usually classed with plants. The term *microbe* is used in the same sense.

Basin. In descriptions of apples and related fruits, the depression at the apex of the fruit. The calyx sits in the basin.

Berry. In botany, and properly, a separate fruit which is pulpy and juicy throughout, as the grape, currant, tomato. The word is commonly employed to denote any soft fruit or fruit-like part which is borne upon a woody or perennial plant. The raspberry and blackberry are collections of little fruits.

Biennial (*adj.*). Persisting two years. As a rule, biennial plants do not blossom until the second year.

Bigeneric half-breed. The product of a cross between varieties of species belonging to different genera.

Bigeneric hybrid. A hybrid between species of different genera; bigener.

Blight. The dying without apparent cause of the tenderer parts of plants, especially of the leaves, flowers and young fruit; as pear blight.

Botany. The science of plants.

Bottle-grafting. A modification of whip-grafting by which a heel of the scion is conducted into a bottle of water to supply temporary nourishment.

Bottom heat. Heat applied underneath plants by artificial means.

Bract. A much reduced leaf. Bracts are usually present about the inflorescence.

Break. A radical departure from the type. Ordinarily used in the sense of *sport*, but in its larger meaning it refers to the permanent appearance of apparently new or very pronounced characters in a species.

Bud. A bud which is inserted in a plant with the intention that it shall grow.

Budding. The operation and practice of inserting a bud in a plant with the intention that it shall grow.

Bulb. A large, more or less permanent leaf-bud, usually occupying the base of the stem, and emitting roots from its lower portion. Bulbs are of two leading sorts; scaly, when composed of narrow and mostly loose scales, as in

Bulb, continued.
the lily; laminated or tunicated, when composed of more continuous and closer-fitting layers, as in the onion.

Bulbel. A small bulb borne about a mother-bulb, as in some bulbous irises and some onions; bulbule.

Bulblet. A small bulb borne entirely above ground, as in the axils of leaves, in the inflorescence, etc.

Bulbo-tuber. A corm.

Bulbule. A bulbel.

Bush. A small woody plant having no central trunk or stem; shrub.

Bush-fruit. Small fruits, as the currant, gooseberry, raspberry and the like.

Callus. The new and protruding tissue which forms over a wound, as over the end of a cutting.

Calyx. The outer envelope of the flower. The parts, when distinct, are called sepals. In apples, pears, etc., part of the calyx persists on top of the fruit.

Cambium. The layer of new tissue which lies underneath the bark. It is usually thin and more or less mucilaginous in spring and early summer.

Cane. A young growth of hard-wooded plants. Usually applied to ripened or hardened shoots a year or less old.

Cantaloupe. A class of musk-melons characterized by firm and warty or scabby rinds.

Capsule. A dry seed-vessel which splits open at maturity; pod.

Carbon dioxide. A gas composed of one atom of carbon to two of oxygen. It is heavier than air, and is poisonous in large quantities; carbonic acid gas.

Carbonic acid. Carbon dioxide.

Carpel. A simple pistil, or one of the divisions of a compound pistil.

Cavity. In descriptions of apples and similar fruits, the depression about the stalk or stem.

Chlorophyl. The green coloring matter of plants.

Cion. See Scion.

Cleft-graft. A sort of grafting in which the scion is cut wedge-shaped at the lower extremity, and is then inserted in a cleft in the end of a trunk or branch which has been severed.

Close fertilization. The action of pollen upon the pistil of the same flower; self-fertilization.

Cold-frame. A frame covered with glass, cloth, or paper, without bottom heat, used for starting plants early in spring, for receiving plants transplanted from a hot-bed or forcing-house, or for protecting plants during the winter.

Conservatory. A glass house for preserving or growing tender plants. Popularly, the term is applied to houses in which plants are grown for display of flowers.

Corolla. The inner envelope of the flower. The parts, when distinct, are called petals.

Corm. A solid bulb-like tuber, as in the gladiolus and crocus; bulbo-tuber.

Corymb. A flower cluster which is flat or convex on top and in which the outer flowers bloom first.

Cotyledon. A small leaf borne in the seed; seed-leaf. In many plants the cotyledons rise to the surface, when the seed germinates, and increase in size.

Cross. The offspring of any two flowers which have been cross-fertilized.

Cross-breed. A cross between varieties of the same species; half-breed, mongrel, variety-hybrid.

Cross-fertilization. The action of pollen upon the pistil of another flower of the same species. Cross-fertilization is commonly used to denote the mere conveyance of pollen —pollination—but better usage confines the term to the action of pollen upon the pistil.

Cross-pollination. The conveyance of the pollen to the stigma of another flower.

Crossing. The operation or practice of cross-pollinating.

Crown-grafting. Grafting at or near the surface of the ground.

Cryptogam. One of the class of flowerless plants. These plants propagate by spores instead of seeds. Ferns, fungi, mosses and sea-weeds are examples.

Cutting. A portion of a plant which is inserted in soil or water with the intention that it shall grow, slip.

Cyme. A flower cluster, flat or convex on top, and in which the central flowers open first.

Deciduous. Said of plants whose leaves fall in autumn.

Derivation hybrid. A hybrid between hybrids, or between a hybrid and one of its parents; derivative hybrid; secondary hybrid.

Dibber. See Dibble.

Dibble. A pointed instrument used for making holes in the ground for the planting of seeds and roots; dibber.

Dicœcious. Said of species in which the stamens and pistils are borne on different plants.

Disbudding. The practice or operation of removing buds.

Double-graft. A plant twice grafted for the purpose of overcoming the lack of affinity between stock and scion.

Double-grafting. The practice and process of twice grafting or budding a plant so that the root, the stem or a part of it, and the top, shall each represent a different variety. It is used when a certain variety will not grow upon a given root, but which will grow on some variety that unites with that root; double-working.

Double-working. See double-grafting.

Drupe. A fleshy or soft fruit formed entirely from the ovary, and containing a hard pit; stone-fruit. The peach and cherry are examples.

Embryo. The rudimentary plant contained in the seed; seed-germ.

Entomology. The science of insects.

Evergreen. Said of plants which hold their leaves during winter.

Eye. A cutting composed of a single bud.

Family. A group of genera and species, as *Cruciferæ*, mustard family; *Graminæ*, grass family. In botany, *order* in the same.

Fecundation. The action of the pollen upon the pistil; fertilization; impregnation.

Female. Used to designate flowers or plants which bear only styles.

Fertilization. The action of the pollen upon the pistil; fecundation; impregnation.

Fertilizer. 1. Any substance which promotes plant growth. 2. Plant food.

Fertilizing. The act or process of applying fertilizers to plants. The word *fertilization* should be restricted to designate the action of pollen.

Flagging. Wilting of newly set plants or herbaceous cuttings.

Flat. A shallow box used by gardeners in which to sow seeds or handle plants.

Floriculture. The cultivation of flowers.

Florist. One who practices floriculture.

Flower. An organ which contains a stamen or pistil, or both. It is usually provided with some kind of an envelope, as calyx and corolla.

Forcing-house. A structure in which plants are grown or forced out of their season.

Frame. The structure forming the sides and ends of cold-frames or hot-beds. *A frame* is usually understood to be the area covered by a single sash, when areas are to be designated.

Fruit. 1. Botanically, a ripened ovary, containing the seeds. 2. Popularly, any edible or ornamental organ or

Fruit, continued.

collection of organs which are closely associated in their origin with the flower.

Fungicide. A substance employed to destroy fungi.

Fungoid (*adj.*). Fungus-like in general appearance or characteristics. A *fungoid* disease is one which appears to be due to a fungus, but whose character is not understood.

Fungous (*adj.*). Pertaining or due to a fungus or to fungi; as, a *fungous* disease.

Fungus (pl., *fungi*). A flowerless plant, devoid of chlorophyl, drawing its nourishment from living plants or animals or from decaying matter.

Gardener. One who practices horticulture on a small or on an intensive scale.

Gardening. The art and science of raising kitchen garden vegetables, fruits and ornamental plants; horticulture. The term is commonly restricted, however, to the operations of growing kitchen garden vegetables and flowers.

Genus (pl., *genera*). A group or kind containing a greater or less number of closely related species; as *Rosa*, the rose genus, *Tilia*, the linden genus.

Germination. The act or process by which a seed or spore gives rise to a new and independent plant.

Gourd. An ambiguous term, used in America to designate various small fruits of the pumpkin and squash genus which are grown for ornament and curiosity. In other countries the term is generic for most pumpkins and squashes.

Graft. Scion, which see.

Graftage. The process of grafting, or the condition or state of being grafted.

Grafting. The operation of inserting a bud or scion upon a stock. It is commonly restricted to the operation of inserting scions of dormant wood, or to those operations in which wax or mastic is used to dress the wounds.

Greenhouse. A glass house in which plants are grown. Originally and properly, however, it was applied to houses in which plants were simply preserved green during the winter.

Ha-ha. A sunken fence.

Half-breed. A cross between varieties of the same species; cross-breed, mongrel, variety-hybrid.

Half-hardy (*adj.*). A term applied to plants which need protection during winter, but which can endure some frost.

Half-hybrid. The product of a cross between a species and a variety of another species.

Hand-box. A box of size sufficient to cover a hill of plants, provided with a cover of glass, cloth, or paper, used to force plants in the hill.

Hardiness. Capability to endure a given climate.

Hardy (*adj.*). Able to withstand a given climate.

Heart-wood. The inner and colored wood of trees. The deeper color and greater hardness of heart-wood are due chiefly to the deposition of mineral matter in the cells.

Herb. A plant possessing but a small amount of hard, woody fibre, the stem of which dies at the approach of winter.

Herbarium. A collection of preserved plants. The plants are usually dried and glued on sheets of paper.

Heeling-in. The process and operation of temporarily covering the roots of plants to preserve them until wanted for permanent planting.

Horticulture. The art and science of raising fruits, kitchen garden vegetables, flowers and ornamental trees and shrubs.

Horticulturist. One who practices horticulture.

Hot-bed. A frame covered with glass, cloth or paper, provided with bottom heat, and used for forcing plants.

Hot-house. A glass house, artificially warmed, in which plants are grown.

Hy'brid, or hyb'rid. The offspring of plants of different species.

Hy'bridism or **hyb'ridism.** The state, quality or condition of being a hybrid; hybridity.

Hy'bridist. One who practices hybridizing.

Hy'bridity or hyb'ridity. Hybridism.

Hy'bridization or hyb'ridization. The state or condition of being hybridized; or the process or act of hybridizing.

Hybridization. The action of the pollen of one species upon the pistil of another species.

Hy'bridizing or hyb'ridizing. The operation or practice of crossing species.

Impregnation. The action of the pollen upon the pistil; fertilization; fecundation.

Inarching. The process of grafting contiguous plants or branches while the parts are both attached to their own roots. When the parts unite, one is severed from its own support.

Individual-fertilization. Fertilization between flowers upon the same plant.

Inorganic. Pertaining to unorganized substances, as minerals, rocks, chemicals, etc.

Insect. An articulate animal which in the mature state has three distinct divisions and six legs.

Insecticide. A substance employed to destroy insects.

Kitchen-garden. An area devoted to the cultivation of "vegetables," or annual plants which yield edible parts.

Kitchen-garden vegetable. An edible portion of an annual plant. A loose term, commonly shortened to *vegetable.*

Landscape gardening. The art of embellishing grounds. It demands a high appreciation of natural scenery and an ability to represent it in grounds.

Landscape horticulture. The operations and manual appliances employed in embellishing grounds; the industrial phase of landscape gardening.

Larva (pl., *larvæ*). The worm-like stage of insects. A larva is commonly called a worm.

Lawn. An area of green-sward used for ornamental purposes.

Layer. A shoot of a plant bent down and partially or wholly covered with earth with the intention that it shall take root, when it can be severed from and become independent of the parent plant.

Layerage. The state or condition of being layered, or the operation or practice of layering plants.

Legume. A simple pod composed of two valves or parts as pea and bean pods.

Leguminous. Of or pertaining to legumes. Used to designate plants of the pea and bean family.

Maiden (*adj.*). Applied to young plants which have not borne.

Male. Used to designate flowers or plants which bear only stamens.

Manure. 1. Any substance which promotes plant growth. 2. Plant food.

Microbe. A term applied to various microscopic organisms, usually classed with plants, which play an important role in disease chemical decomposition and decay.

Mildew. A powdery or mold-like growth attached lightly to the surface of the plant, particularly when it is white or nearly so, as gooseberry mildew.

Mongrel. A cross between varieties of the same species; half-breed; cross-breed; variety-hybrid.

Monœcious. Said of plants in which the stamens and pistils are borne in different flowers on the same plant.

Mother-bulb. The large bulb about which bulbels are formed.

Mycology. The science of fungi.

Nursery. An establishment for the rearing of plants. In America the word is used in connection with woody plants only.

Offscape. The landscape which lies adjacent to one's grounds.

Olericulture. The cultivation of kitchen garden vegetables; vegetable gardening.

Open. An unplanted ortion of grounds; an open lawn or field.

Order. Family, in botany.

Organic. Pertaining to organized or living bodies or their remains.

Ovule. A sexual body borne in the ovary, which, when mature, becomes the seed.

Ovary. The lower extremity of the pistil, which, when mature, becomes the fruit. It contains the ovules.

Panicle. An open and more or less compound flower-cluster.

Papilionaceous. Butterfly-like: said of flowers of the pea and bean family, from their fancied resemblance to butterflies.

Parasite. A plant or animal which lives upon living plants or animals.

Pedicel. The stalk of a particular flower in a cluster. A flower which is borne singly has a peduncle.

Peduncle. A stalk of a flower which is borne singly, or of a cluster of flowers.

Pepo. A berry-like fruit in which the rind is hardened, and which belongs to the gourd family, as the pumpkin, melon, cucumber, etc.

Perfect. Said of flowers which bear both stamens and pistils.

Perianth. The leaves of a flower. Usually applied to those flowers in which the calyx and corolla are nearly alike, as the lily.

Perennial (*adj.*). Persisting from year to year. The term *perennial* is commonly understood to designate herbaceous plants which live for many years.

Pet'al, or Pe'tal. One of the separate parts of the corolla; an inner leaf of a flower.

Petiole. The stem of a leaf.

Phenogam. One of the class of flowering plants. These plants propagate by seed.

Pip. A term applied to certain small seeds or seed-like fruits of berries and other fruits.

Pip'ing. A cutting

Pistil. That portion of the flower which receives the pollen and bears the seeds. It always has two parts, the stigma and the ovary, and these are usually connected by a style. It is the female organ of the plant.

Pistillate. Bearing pistils alone; female.

Plantlet. The little plant just emerged from the seed. It becomes a plant when it is able to assimilate and lead an independent existence.

Pod. A dry seed-vessel which splits open at maturity; capsule.

Pollen. A product of the anthers which is capable of fertilizing the stigma. It is usually granular and powdery.

Pollination. The conveyance of pollen from the anther to the stigma.

Polygamous. Said of plants or species which bear both perfect and imperfect flowers.

Pome. A fleshy fruit with a papery core surrounded by a greatly thickened calyx, as the apple, quince, etc.

Race. A fixed variety; that is, a variety which reproduces itself more or less uniformly from seeds.

Raceme. A more or less elongated and simple flower cluster with one-flowered pedicels.

Regermination. Second germination. Seeds which have been checked after germination has begun may resume the process under favorable conditions.

Root. A part of the plant which bears neither leaves nor buds, and which absorbs nourishment for the plant, or serves as a support for it. It may be subterranean or ærial.

Root-cap The covering upon the end of a growing root. The elongation of the root takes place just behind the root-cap.

Root-grafting. Grafting upon the root.

Root-hair. A very delicate prolongation of a cell of a young root. Root hairs are active agents in absorbing plant food.

Rot. The decay of the thicker part of plants, however brought about; the amount of moisture present determining whether it shall be called wet or dry rot, as potato-rot.

Runner. A procumbent or creeping herbaceous shoot which takes root at the joints.

Rust. Any plant disease in which the surface of the plant is apparently converted into a powder or scurf, particularly when of a ferruginous or blackish color, as wheat rust.

Saddle-graft. A sort of grafting in which the scion is split below and inserted over the end of the stock, which is cut wedge-shape.

Salad. A dish of uncooked herbs, or chopped meat combined with uncooked herbs.

Sap. A term designating loosely the liquid contents of plants

Saprophyte. A plant which lives upon dead or decaying matter, as a mushroom or toadstool.

Scion, or **Cion.** A portion of a plant which is mechanically inserted upon the same or another plant with the intention that it shall grow; a graft As commonly used, a scion, in distinction from a bud, bears two or more buds.

Secondary hybrid. A hybrid between hybrids, or between a hybrid and one of its parents; derivative hybrid; derivation hybrid.

Se′pal, or Sep′al. One of the separate parts of the calyx; an outer leaf of a flower.

Shoot. A soft and growing branch.

Shrub. A small and bushy woody plant, with no central stem or trunk: bush.

Side-graft. A sort of grafting in which the scion is inserted in a slit or oblique cleft in the side of the stock.

Slip. A cutting.

Small-fruit. Low and bush-like fruit plants, and the fruits they produce, as the currant, gooseberry, blackberry, strawberry and the like.

Splice-graft. A sort of grafting in which both the scion and stock are cut off obliquely and the cut surfaces applied to each other, the two scions being held secure by bands of string.

Seed. The sexual reproductive organ of flowering plants; a ripened ovule. Its essential part is the embryo, or rudimentary plantlet.

Seedage. The process of propagation by seeds, or the state or condition of being propagated by seeds.

Seed-germ. The rudimentary plant contained in the seed; embryo.

Seedling. A plant growing directly from the seed, without the intervention of grafts or cuttings.

Self-fertilization. The action of pollen upon a pistil of the same flower; close-fertilization.

Self-pollination. The transfer of pollen to a pistil of the same flower.

Spore. The reproductive body of a flowerless plant, answering to the seed of a flowering plant. It contains no embryo.

Spur. A very short and small branch bearing leaves or flowers.

Stalk. In descriptions of apples and similar fruits, the stem or pedicel.

Stamen. That portion of the flower which bears the pollen. It consists of the anther and filament. It is the male organ of the plant.

Staminate. Bearing stamens alone; male.

Stem. That portion of the plant which bears leaves or buds, or both. It may be ærial or subterranean.

Stigma. The upper extremity of the pistil upon which the pollen is received. It is usually more or less pappilose and glutinous.

Stipule. A more or less leaf-like and usually small appendage at the base of a petiole. Stipules are borne in pairs, but they are not always present.

Stock. 1. The parentage of a particular strain or variety. 2. A plant or part of a plant upon which a bud or graft is set.

Stolon. A decumbent shoot which roots at or near the tip, as the shoots of black raspberries.

Stove. A very warm glass house, used for growing tropical plants.

Strain A sub-variety, or individuals of a variety, which has been improved and bred under known conditions.

Stub. A portion of a trunk or branch which has been recently grafted. Usually applied to top-graftng.

Style. The more or less slender portion of the pistil connecting the stigma and ovary.

Tongue-graft. Whip-graft.

Top-grafting. Grafting upon the top of a plant.

Tree. A woody plant attaining the height of a man or more, and having a definite central stem or trunk.

Truss. Loosely applied to clusters of flowers or fruits.

Tuber. A prominently thickened root or stem, usually subterranean.

Umbel. A flower cluster which is flat or flattish on top, and whose pedicels start from a common point, or nearly so.

Variety-hybrid. A cross between varieties of the same species; half-breed; cross-breed; mongrel.

Vegetable. 1. A plant. 2. In horticulture, an edible portion of an annual plant; kitchen-garden vegetable. In the latter sense, a loose term.

Vegetable-gardening. The cultivation of kitchen-garden vegetables; olericulture.

Vegetation. 1. Vegetable or plant life. 2. The process or act of vegetating or growing.

Veneer-graft. A sort of grafting in which the scion is applied to the side of the stock, only the bark being removed between them.

Viticulture. Grape culture.

Weed. A plant which grows where it is not wanted and which becomes troublesome.

Whip-graft. A species of grafting in which the scion is secured to the stock by means of a tongue which is inserted in a cleft in the stock; tongue-graft.

Wilding. A wild or uncultivated plant. Commonly used to designate the wild individuals of a cultivated species.

Wind-shake. An injury to the trunk of a tree, consisting of the more or less complete separation of the concentric annual layers or of the separation of the bark from the wood. The injury is commonly ascribed to the wind, but it is oftener due to the frost and other causes.

Winter-killing. The process or act by which a plant is killed by the climate of winter.

Worm. A term properly applied to a large class of legless articulated animals, of which the angle-worm, or earth-worm, and trichina are examples. The term is commonly, but improperly, applied to the larvæ of insects.

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ADVERTISEMENTS.

The Annals of Horticulture For 1890.

By L. H. Bailey, corresponding Editor of *The American Garden*, Horticulturist of the Cornell Experiment Station, and Professor of Horticulture in Cornell University; assisted by specialists in the different departments, and correspondents in all parts of the world.

This book, long in preparation, and now nearly ready, has met with the heartiest approbation in all quarters. Following, we quote the author's preface and table of contents:

PREFACE.

A series of Annals of Horticulture, of which the present volume is the initial, is projected for the purpose of preserving in convenient form a record and epitome of yearly progress in horticulture. Our horticultural interests are becoming so various and extensive, and records of them are so widely scattered, that such compendiums are a necessity; and summaries of the most important discoveries and discussions must have a direct and immediate practical use, wholly aside from their values as history. A leading feature of the series must necessarily be complete records of the introduction of horticultural plants; and the author desires that these volumes shall comprise the standard publication of new varieties. So far as record is concerned, these publications can serve the purpose of the certificates issued for new varieties by the Royal Horticultural Society in England, and by similar organizations in other countries; and to this end, all North American originators and introducers are solicited to make records of their novelties and introductions. It certainly requires no argument to convince both dealer and purchaser that all interests will be greatly subserved by such annual records.

Complete lists of all the varieties of fruits, kitchen-garden vegetables and ornamentals now cultivated in North America are needed. Such lists are indispensable to an understanding of the present condition of our horticulture, and they become more valuable in each succeeding year as matters of history. They would furnish invaluable material for the study of the direction and extent of variation in cultivated plants; and, as varieties increase, they should serve a purpose in preventing the duplication of varietal names. A contribution to such comprehensive record has been made in this volume, in the insertion of a list of all the varieties of kitchen-garden vegetables now cultivated in North America, so far as the names can be

learned. The list has been prepared at immense labor and with great care. It is expected that similar lists for fruits and ornamentals will be added in other years.

The present volume is in many directions fragmentary, and incomplete in design. It is prepared under the pressure of many new enterprises, and it has the faults inherent in new ventures. It is particularly desired that future volumes shall be broader in their scope, and that European horticulture, particularly in all its relations to our own, shall receive greater attention. It is the purpose to present in each volume a few fresh and attractive accounts of the horticultural interests of other countries, in extension of the plan already inaugurated in our last chapter.

The author is aware that the accumulations of the year can never be complete unless the horticulturists of the country cooperate in making them, and he will be grateful for any facts which are worthy of record.

L. H. BAILEY.

December 31, 1889. GARDEN HOME, Ithaca, N. Y.

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I. GENERAL ANNALS: Review of Yields and Prices of 1889. Horticultural Work of the Experiment Stations. Horticultural Work of the Department of Agriculture. Economic Entomology. Arsenites for the Curculio Combating Insects with their Parasites. Vegetable Pathology Laws for Checking Insect Ravages and Plant Diseases. Oriental Fruits. The New Plants of the Southern States. Fruits for the Cold Prairie States. Fruits for the Cold North, and Protection of some Tender Fruits. Notes on Fruits in California. Recent Tendencies in Ornamental Gardening, and in Ornamentals. Chrysanthemums. Orchids. The National Flower Discussion. Laws to Regulate Weights and Measures. Societies.

II. RECENT HORTICULTURAL LITERATURE: Reviews of Books on Horticulture for 1889. Review and Abstracts of all Bulletins of Horticultural Interest which have Appeared from the Congressional Experiment Stations. Lists of the Horticultural Periodicals of the World.

III TOOLS AND CONVENIENCES OF THE YEAR.

IV. ANNALS OF PLANTS: Complete Lists of all the Fruits, Vegetables and Ornamental Plants Introduced in 1889. A Complete List of all the Varieties of Vegetables now Cultivated in North America, with Revision of the Names by the Horticultural Committee on Nomenclature. Plant Portraits in all Periodicals of the Year.

V. DIRECTORIES: Officers of all the National, State, Provincial and other Important Horticultural Organizations of North America. Horticulturists of the Experiment Stations. Botanic Gardens of the World.

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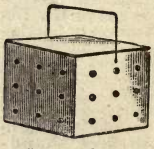

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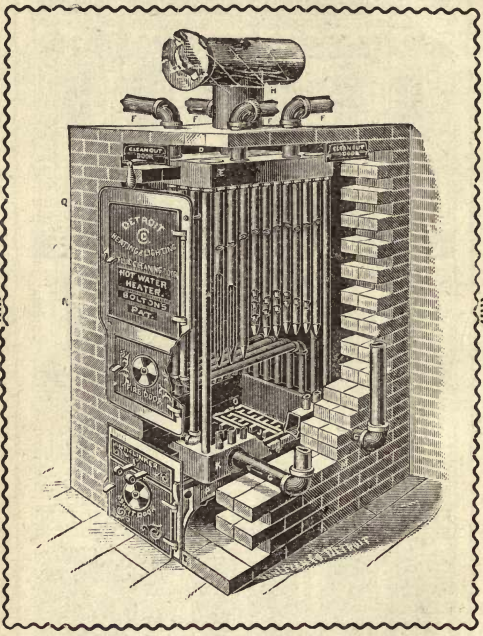

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